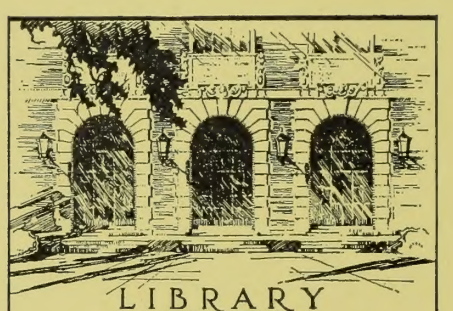

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VOLUME 1, NUMBER 1
JANUARY 1968

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Manager, Water Resources
Scientific Information Center
U.S. Department of the Interior
Washington, D.C. 20240

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R202420X67A INDISPENSABILITY--A MANAGEMENT HAZARD

Most organizations have at least one executive who prides himself on being indispensable. He achieved this opinion of himself early in his career when he realized his abilities. On the assumption that his skills were unique, he built an organization around him to support his self-image. His organizational rules include: (1) all major decisions are made by him, (2) his ideas are the only important ones, and (3) his methods are to be used exclusively. His employees become increasingly dependent and security-minded, become yes-men and subordinate all their ideas and abilities, or become discouraged and resign. His practices affect his own professional growth, and he finds that he cannot advance without building a functionally independent team of workers. He must be convinced that his influence will be more persuasive as a coach and planner; getting out of his tightly controlled little circle can advance him to a more exciting career; and delegating responsibilities can attract and develop more efficient and creative people, who in turn will help him improve his status as an executive. The change cannot be expected overnight, for the process of reeducation is slow and requires time and patience; however, his abilities usually warrant the effort.

R202420X67A

Grossman, Jack H
INDISPENSABILITY: A MANAGEMENT HAZARD
Admin Mgt, Vol 28, No 6, pp 42-45, June 1967. 3 p
DESCRIPTORS-- administration/ *management/ decision making/ training/ leadership// *behavior /psychology// responsibilities/ *employee relations/ human behavior/ human engineering/ *motivation/ personnel management/ psychology/ reasoning/ *supervision/ characteristics/ efficiencies/ standards/ methodology
IDENTIFIERS-- ideas/ professional advancement

R202481X67A PLANNING FOR REAL-TIME BUSINESS SYSTEMS

Systems planning, always important in computer system design, is even more important in real-time systems. For the optimum allocation of a company's resources, systems planning can be viewed as a management tool for exploiting new technological developments and introducing more complex systems. Systems planning is planning for systems rather than planning of particular systems; it embraces all areas of information processing technology, including equipment evaluation and selection, system design, programming, and computer operations. The modern systems planner should seek the answers to 3 basic questions: (1) what is the technology going to be like during the planning period, (2) what changes will take place in the organization's operating environment, and (3) what are the long-range corporate goals and objectives. In most progressive companies, systems planning is conducted on a formalized basis and integrated with corporate, budgetary, product, organizational, and personnel planning. The article concludes with a discussion of 11 guidelines for systems planning.

R202481X67A

Head, Robert V
PLANNING FOR REAL-TIME BUSINESS SYSTEMS
Systems & Procedures Jour, Vol 18, No 4, pp 10-17, July-Aug 1967. Software Resrcs Corp, Los Angeles, Calif, 8 p, 5 fig
DESCRIPTORS-- *systems analysis/ *planning/ *methodology/ *data processing systems/ computers/ decision making/ management/ automation/ documentation/ economics/ data storage systems/ data collection systems/ coordination/ feedback/ operations research/ control/ integration/ technology/ requirements
IDENTIFIERS-- *systems engineering/ *management planning/ goals/ *real-time operation/ information systems/ procedures

CHEMICAL ENGINEERING

R202410X67A SULFIDE STRESS CORROSION OF STEEL

No simple solution to the problem of sulfide stress corrosion has been found nor is there universal agreement on the failure mechanism. Until the mechanism of sulfide cracking is understood, development of resistant alloys must be on an empirical basis. Many believe that cracking in an aqueous hydrogen sulfide system is best explained by hydrogen embrittlement; others believe that stress corrosion cracking is the predominant mode of failure. The primary variables influencing hydrogen-induced delayed failure in steel are strength level, stress level, and hydrogen content; these factors also influence susceptibility to sulfide cracking. In general, resistance to cracking diminishes as strength increases, and normalized or normalized and tempered steels are less resistant than quenched and tempered steels. With the exception of carbon, changes in alloy content not affecting microstructure have no influence on sulfide cracking. Small changes in microstructure can profoundly change cracking resistance. Austenitic steels are more resistant than steels with body-centered structures; therefore, an increase in elements such as nickel and manganese which lower the martensite transformation temperature and stabilize the face-centered structure can be very beneficial. Has 26 references.

R202410X67A

Snape, E
SULFIDE STRESS CORROSION OF SOME MEDIUM AND LOW ALLOY STEELS
Corrosion, Vol 23, No 6, pp 154-172, June 1967. Intl Nickel Co, Inc, Suffern, N Y, 19 p, 26 fig, 7 tab, 26 ref
DESCRIPTORS-- metals/ metals testing/ metals treatment/ *metallurgy/ heat treatment/ *steel/ *steel pipes/ alloys/ microstructures/ corrosion/ yield strength/ stress/ *cracking// failure /mechanics// grain structure /metals// chemical engineering/ *materials/ bibliographies
IDENTIFIERS-- *sulfide cracking/ *hydrogen embrittlement/ stress corrosion

CIVIL ENGINEERING

R202445 67A REINFORCED CONCRETE PIPE DESIGN

The procedure for designing a reinforced concrete pipe installation is outlined. The author emphasizes that: (1) the ultimate 3-edge bearing test strength has no meaning in terms of field performance, and (2) there is no basis for translating results of the laboratory test into an ultimate strength under field conditions. He recommends that the most appropriate approach to design of a reinforced concrete pipe installation is to utilize the 0.01-in. crack test strength (or some similar visible and measurable indicator of early load effect) as a basis for selecting pipe strength and specified bedding and backfilling requirements. An example of pipe culvert design based on the 0.01-in. crack, 3-edge bearing strength is presented. Behavior of a reinforced concrete pipe loaded by earth overburden is described, and the reason for concrete spalling at the crown and invert is presented. Repair methods which take advantage of passive soil pressures at the sides of the pipe are described and examples given. A history of the development of ASTM standard specifications for reinforced concrete pipe is included.

R202445 67A

Spangler, M G
THE CASE AGAINST THE ULTIMATE LOAD TEST FOR REINFORCED CONCRETE PIPE
Hwy Res Record, No 176, pp 35-42, 1967. Iowa State U, Ames, 8 p, 8 fig, 3 ref
DESCRIPTORS-- standards/ specifications/ *concrete pipes/ repairing/ structural design/ reinforced concrete/ ultimate loads/ cracks/ *bearing capacities/ passive pressures/ lateral forces/ *culverts/ soil pressures/ backfills/ overburden/ *materials testing/ load distribution/ deformation/ *pipes/ sewers
IDENTIFIERS-- pipe bedding/ spalling/ *buried pipes

R202440X67A PRESTRESSED LIGHTWEIGHT CONCRETE

CONCRETE TECHNOLOGY

A discussion of prestressed lightweight concrete made with high-quality structural lightweight aggregates such as expanded shales, clays, and slates is presented. Capable of developing cube strengths from 280 to 500 kg/cu cm (4000 to 7000 psi) at unit weights of 1400 to 2000 kg/cu m (85 to 120 pcf), this concrete has been used satisfactorily in factory production of standardized structural elements and for individual major structures requiring a high degree of technical performance and reliability. Satisfactory values of shrinkage and creep are obtainable. Modulus of elasticity is approximately half that of normal concrete at the same strength. Fire resistance and thermal insulation are significantly better than for normal weight concrete. Specific applications are listed, and cement content, gross water requirement, unit weight, elasticity modulus, creep, shrinkage, tensile strength, resistance to freezing and thawing, fire resistance, rupture modulus, pullout bond strength, and ultimate strain are discussed.

R202440X67A

Anonymous
REPORT OF THE FIP COMMISSION ON PRESTRESSED LIGHTWEIGHT CONCRETE
Jour of PCI, Vol 12, No 3, pp 68-93, June 1967. 26 p, 18 fig, 2 tab, append
DESCRIPTORS-- concrete/ *prestressed concrete/ *lightweight aggregates/ concrete technology/ shales/ clays/ slates/ compressive strength/ bondings/ unit weight/ creep/ shrinkage/ tensile strength/ elasticity modulus/ permeability/ concrete mixes/ curing
IDENTIFIERS-- bonding strength/ expanding cements/ fire resistance/ pull-out tests

R202460X67A FROZEN GROUND CONSTRUCTION TECHNIQUES

CONSTRUCTION

Artificially freezing unstable ground to sink a shaft was first tried in Wales in 1862. Although the process is used mainly for sinking shafts, it has been adapted for tunnel excavation through bad ground or running sand, stabilizing embankments and excavations to prevent slides, and maintaining frozen ground under heated buildings constructed on permafrost. In shaft sinking, for example, vertical freeze-pipes, usually from 4 to 6 in. in diameter, are placed about 4 ft apart in a circle outside the shaft area and chilled brine is circulated in the pipes to extract heat from the ground. Changing the pore-water to ice stabilizes the soil. Frozen soil is not an elastic material, but creeps under steady load. Parameters are temperature and time dependent. Strength computations are made assuming plastic failure and Coulomb's law; deformation is computed separately for a given time by means of the simplest possible creep equation. Principles of design and refrigeration requirements are given. Gives 32 references.

R202460X67A

Sanger, Frederick J
FROZEN GROUND CONSTRUCTION TECHNIQUES
Conf Preprint 514, ASCE Struc Engg Conf, Seattle, Wash, May 1967. USA CRREL, Hanover, N H, 45 p, 18 fig, 6 tab, 32 ref
DESCRIPTORS-- *frozen soils/ construction/ drilling/ thermal insulation/ tunneling/ caissons/ *freezing/ soil stabilization/ creep/ soil pressures/ temperature/ instrumentation/ heaving// shafts /mining// deformation/ time/ Youngs modulus/ bibliographies/ stress-strain curves/ tunnel construction/ thermal conductivity/ cold weather operations/ refrigeration/ mechanical properties
IDENTIFIERS-- Coulomb law

R202429 67A SPILLWAY AND STILLING BASIN DESIGN

Results of a study of spillways and stilling basins in Germany are reported. The purpose of the study was to establish designs for improved economy, capacity, and efficiency of such structures. Improvement of spillway intake capacity by installing tilted and enlarged pier noses is described. The effects of guide walls on superelevated flow in curved spillway chutes are discussed. Design criteria for shaped spillway crests and for side walls with chutes carrying supercritical flow are given. Two types of unconventional stilling basins are examined.

R202429 67A

Hartung, F and Knauss, J
DEVELOPMENTS TO IMPROVE ECONOMY, CAPACITY, AND EFFICIENCY OF STRUCTURES CONTROLLING THE PASSAGE OF FLOOD WATER THROUGH RESERVOIRS. Paper, Proc, 9th ICOLD Conf, pp 227-249, Istanbul, Turkey, Sept 1967. Oskar v. Miller-Inst, Obernach, West Germany, 23 p, 27 fig, 1 tab, 5 ref
DESCRIPTORS-- *spillways/ spillway crests/ spillway gates/ standing waves/ *stilling basins/ *discharge coefficients/ training walls/ piers/ *chutes/ hydraulics/ shock waves/ channels/ *energy dissipation/ hydraulic models/ baffles/ dentated sills/ Froude number/ model tests/ supercritical flow/ optimum design/ design/ efficiencies/ foreign design practices
IDENTIFIERS-- guide walls/ Germany/ pier noses

R202432X67A UPLIFT IN GRAVITY-TYPE DAMS

Available literature on the subject of uplift is critically reviewed. For discussion purposes, uplift theories are divided into 2 groups: (1) those assuming the action of uplift to be associated with the formation of visible or imaginary cracks, and (2) those characterized by assumed permeability of uninjured masonry or concrete. The use of a coefficient of reduction, prevalent in the older theories, is discussed and discounted, and the conclusion that uplift acts over 100% of the base area is justified. Characteristics fundamental to the development of all modern mathematical theories on uplift are specified, and the relationship between uplift factor and porosity coefficient is discussed. Leliavsky's laboratory method for determining the effective superficial porosity of a material is described. Various proposals for determining the magnitude of uplift in gravity dams are critiqued. Has 17 references.

R202432X67A

Attri, Narinder S
UPLIFT IN GRAVITY TYPE DAMS
ASCE Proc, Jour Struc, Vol 93, No ST4, Paper 5377, pp 61-68, Aug 1967. The Boeing Co, Renton, Wash, 8 p, 3 fig, 17 ref, append
DESCRIPTORS-- *uplift pressures/ underseepage/ flow nets/ *gravity dams/ *pore pressures/ *concrete dams/ porosity/ laminar flow/ pore water pressures/ bibliographies/ hydrostatic pressures/ reviews/ theory/ seepage/ porous materials/ cutoffs/ drainage systems/ impervious blankets/ grout curtains/ hydraulic gradients/ permeability
IDENTIFIERS-- uplift resistance

R202449 67A BAFFLE GATE FOR CLEANING SPAWNING CHANNEL

The Tehama-Colusa Canal in California is the first known dual-purpose canal being used both as a salmon spawning grounds and a conveyance structure to supply irrigation water. This study is concerned with cleaning deposited sediment from the 2.5-ft-deep gravel spawning bed in the dual-purpose channel and related problems. Exploratory tests were made in a 2- x 2- x 8-ft-long flume to determine which of various possible cleaning methods might be successful. These preliminary tests considered underdrains, water and air jets, a floating barge with and without underwater baffles, a mechanical cleaning device, and a baffle gate by which the sediment was washed from the gravel as the gravel was moved a short distance downstream. Based on these tests, the baffle gate method was studied in detail in a larger flume 4 ft wide, 8 ft deep, and 80 ft long. Tests were made with prototype-size gravel (3/4 to 6 in.) up to the depth and discharge capacity of the flume. To test the full prototype depth, gravel sizes were reduced on a 1:2 scale. Depth that the gravel would be scoured was related to 2 variables: position of the baffle gate above the gravel and differential head across the gate. Requirements for successful spawning by salmon are discussed and hydraulic design criteria for the facility are included.

R202449 67A

Carlson, E J
BAFFLE GATE METHOD FOR CLEANING SALMON BEDS IN CANALS
Proc, 12th Cong of IAHR, Vol 3, pp 266-274, Fort Collins, Colo, Sept 1967.
Bureau of Reclamation, Denver, Colo, 9 p, 4 fig, 4 ref
DESCRIPTORS-- canals/ *irrigation canals/ *cleaning/ open channel flow/ trapezoidal channels/ *fish handling facilities/ fishways/ gravel blankets/ multiple purpose structures/ suspended sediments/ gravels/ tractive forces/ movable bed models/ gates/ baffles/ sediment control/ boundary shear/ fish/ velocity distribution/ laboratory tests/ scour/ irrigation O&M
IDENTIFIERS-- salmon/ *spawning channels/ Tehama-Colusa Canal, Calif/ redds

R202450 67A DROP STRUCTURES IN TRAPEZOIDAL CHANNELS

Hydraulic characteristics of flow over drop structures connecting 2 trapezoidal channels at different elevations are considered. The drop structures, some with weirs, and some without, are formed by an abrupt drop in the horizontal channel bottom. Relationships among the quantities pertinent to the hydraulic characteristics were investigated through dimensional and experimental analyses. The dimensional analysis, based on theoretical consideration of the flow problem, resulted in a set of dimensionless parameters; namely, relative depth after hydraulic jump, drop number, and geometrical parameters of the drop structure. Bottom width, side slope, vertical drop, and weir height were varied systematically in the experimental channels. Over 170 test runs were analyzed and are presented in graphical form. Experimental data from other studies of flow over vertical drops in rectangular channels are included to compare the effects of trapezoidal and rectangular geometry on hydraulic characteristics.

R202450 67A

Shih, Cornelius C and Parsons, Donald F
SOME HYDRAULIC CHARACTERISTICS OF TRAPEZOIDAL DROP STRUCTURES
Proc, 12th Cong of IAHR, Vol 3, pp 249-259, Fort Collins, Colo, Sept 1967.
U of Alabama, Huntsville; FPC, Washington, D C, 11 p, 10 fig, 9 ref
DESCRIPTORS-- *drops /structures// *trapezoidal channels/ open channel flow/ *hydraulic jumps/ weirs/ hydraulic models/ *dimensional analysis/ geometry/ cross sections/ fluid mechanics/ hydraulics/ energy dissipation/ *control structures/ baffles/ steady flow
IDENTIFIERS-- hydraulic design

R202452 67A SCOUR IN TAILWATER OF SHAFT SPILLWAYS

Results of laboratory investigations on the effect of macroturbulence (velocity and pressure pulsation) in stilling basins and outlet channels below shaft spillways are reported. Layouts of regulating structures considered include: (1) diverging channel section with baffle piers and baffles, (2) rectangular section with baffle sill, (3) rectangular section with baffles, and (4) jet impingement from a double conduit spillway. Values are given for the pulsation coefficient of hydrodynamic loads acting on the baffle piers and baffles under different conditions; relationships to be used for determining slab thickness of basin and channel floors and slopes for a double conduit spillway are presented. Charts of tailwater bottom velocities required for predicting scour are included. Scour is shown to be determined mainly by the actual bottom velocities, and an approximate method for forecasting depth of scoured holes is proposed.

R202452 67A

Rozanov, N P; Givotovsky, L S; Pashkov, N N
THE EFFECT OF MACROTURBULENCE IN THE TAILWATER OF TUBULAR SPILLWAYS ON TAILWATER STRUCTURES AND LOCAL SCOURING. Proc, 12th Corg of IAHR, Vol 2, pp 144-153, Fort Collins, Colo, Sept 1967. Kuibyshev Civ Engg Inst, Moscow, USSR, 10 p, 6 fig, 11 ref
DESCRIPTORS-- turbulence/ *stilling basins/ *energy dissipation/ spillways/ *backwater/ model tests/ hydraulic models/ dentated sills/ hydraulic jumps/ baffles/ velocity/ velocity distribution/ discharges/ rectangular conduits/ *scour/ pipes/ submergence/ tailrace/ slabs/ slope protection/ *erosion/ laboratory tests
IDENTIFIERS-- *tailwater/ foreign research/ USSR/ macroturbulence

R202453 67A PRESSURE FLUCTUATIONS IN STILLING BASINS

Knowledge of the amplitude-frequency spectrum of pressure fluctuations caused by turbulence in hydraulic structures allows determination of dynamic loading in structural design. Pilot studies into the use of electronic equipment in the analysis of random pressure fluctuations in models of 2 distinct types of stilling basins are described. The models investigated represented Morrow Point Dam with a free-fall spillway with impact-type energy absorbing pool at the base of the dam and Crystal Dam outlet works having a hydraulic jump stilling basin with a center wall separating the jets from 2 high-pressure slide gates. Data from the 2 models showed marked differences in the frequency spectra. The studies were restricted to determining dynamic loads acting on the structures, without regard to the dynamic response of the structures. The analyses described allow solution to 2 problems encountered in the design of hydraulic structures: (1) determination of stresses caused by the application of a periodic force at a given frequency, such as the natural frequency of the structure; and (2) determination of stresses resulting from the complete spectrum of forces and frequencies under nonresonant conditions.

R202453 67A

King, D L
ANALYSIS OF RANDOM PRESSURE FLUCTUATIONS IN STILLING BASINS
Proc, 12th Cong of IAHR, Vol 2, pp 210-217, Fort Collins, Colo, Sept 1967. Bureau of Reclamation, Denver, Colo, 8 p, 5 fig
DESCRIPTORS-- *stilling basins/ Fourier analysis/ *pressure distribution/ hydraulic structures/ structural design/ *live loads/ *spectrum analysis/ electronic equipment/ spectra/ model tests/ hydraulic models/ transducers/ frequency analyzers/ frequency/ stress analysis/ pressure measuring equip/ oscillographs
IDENTIFIERS-- Morrow Point Dam, Colo/ Crystal Dam, Colo/ *dynamic loads/ *amplitude

R202476X67A DJATILUHUR PROJECT

Construction of the Djatiluhur Project on the island of Java was completed in 1967. The project provides irrigation, hydroelectric power, and flood protection. Djatiluhur Dam is a 114.5-m-high rockfill dam with a compacted earth core and is believed to be the largest in Southeast Asia. The reservoir covers 83 sq km and has a capacity of 3 billion cu m. An unusual feature is a circular concrete tower housing the powerplant and spillway. The spillway has a capacity of 3000 cu m/sec, meeting estimated requirements for passing the peak of a thousand-year flood. The power station has 6 31-mva generators and, in normal operation, a head of 48.5 to 80.5 m. Geography and geology of the area are outlined and noteworthy features of the project, transmission lines, power station operation during floods, and reservoir regulation are described briefly.

R202476X67A

Bohn, M and Hamon, M
THE DJATILUHUR PROJECT
Water Pwr, Vol 19, No 8, pp 305-315, Aug 1967. Coyne & Bellier, Paris, France, 11 p, 13 fig, 6 ref
DESCRIPTORS-- foreign construction/ foreign design practices/ irrigation/ *foreign projects/ *hydroelectric powerplants/ flood peaks/ flood control/ spillways/ rock fills/ *multiple purpose projects/ reservoir operation/ dam foundations// switchyards /electrical// engineering geology/ water quality/ safety
IDENTIFIERS-- Djatiluhur Project, Java/ Indonesia

R202444X67A DRILL RIG FOR DEEP DRAINAGE OF SLOPES

The best method for stabilizing landslides in Czechoslovakia is to drill drainage bores with augers or core drilling equipment. Investigations were conducted to find mobile-type equipment which could drill both vertical exploratory holes and inclined drainage bores. After a series of comparative tests, the machine selected was the PZV rig made in Czechoslovakia. The rig is mounted on the chassis of an extremely sturdy 12-ton cross-country truck and has standard tooling for augering bores of 150-, 250-, and 480-mm diameters; it can drill at any angle from the vertical to the horizontal (pointing straight back along the axis of the truck) and between 40 deg off vertical to the left and 100 deg off vertical to the right of the truck. The machine was evaluated in exploratory as well as deep-drainage roles on a site where comparable equipment previously had been used to prevent landslides. The performance of various drill rigs (all working under the same geological and morphological conditions) is plotted for comparison and the site preparation time required by these rigs compared.

R202444X67A

Tkany, Zdenek and Zapeca, Vaclav
DEEP DRAINAGE OF SLOPES WITH THE PZV DRILL SET
Tech Digest, Vol 9, No 7, pp 454-458, July 1967. Tech U, Brno, Czech; Chepos Works, Uhersky Brod, Czech, 5 p, 9 fig, 1 tab
DESCRIPTORS-- drainage systems/ *landslides/ soil stabilization/ *augers/ vertical drains/ *drilling equipment/ portable/ core drilling/ drill holes/ rotary drilling/ boreholes/ auger borings/ slopes/ drills/ variable-speed drives/ casings/ *drilling/ subsurface investigations/ drainage/ plastic tubing
IDENTIFIERS-- Czechoslovakia/ comparative studies/ polyvinyl chloride/ foreign research

DRAINAGE AND GROUND WATER

R202473 67A RAINFALL SEEPAGE AND DRAINAGE

The problem of steady rainfall seepage into soil lying above an impermeable layer drained by ditches of unequal water level heights is investigated. A theoretical solution and numerical results are presented for the case of drainage ditches just reaching or penetrating into the impermeable layer. The problem is solved by using a finite series of orthonormal functions generated from products of trigonometric and hyperbolic functions. The solution gives the potential function and stream function for a range of water level heights, ditch spacings, and R/K ratios (rainfall rate R to hydraulic conductivity K). If R/K is increased from 0 to 0.05 for ditches spaced 10 m apart with 2 adjacent ditches maintaining water 1 and 1.5 m above the barrier, the maximum water table height in the soil will increase from 1.50 to 1.82 m. As R/K increases, the maximum water table elevation will approach a position midway between the ditches. Flow nets and other results computed for a number of geometries provide additional information. Has 16 references.

R202473 67A

Powers, W L; Kirkham, Don; Snowden, G
SEEPAGE OF STEADY RAINFALL THROUGH SOIL INTO DITCHES OF UNEQUAL WATER LEVEL HEIGHTS. Soil Sci Soc Amer Proc, Vol 31, No 3, pp 301-312, May-June 1967. Iowa State U, Ames, 12 p, 11 fig, 1 tab, 16 ref
DESCRIPTORS-- water table/ ground water/ *groundwater flow/ drainage/ flow nets/ *seepage/ rainfall/ ditches/ drainage systems/ mathematical analysis/ computation/ integration/ computer programming/ hydraulic conductivity/ bibliographies
IDENTIFIERS-- Dupuit-Forchheimer idealiza/ Laplace equations/ drain spacing/ boundary conditions

ELECTRIC POWER

R202416X67A ECONOMIC LOAD SCHEDULING

Economic load scheduling for multiplant power systems has received much attention in the last 2 decades. Computers have been used to issue instructions to separate plants to adjust their outputs at regular intervals for economical operation in accordance with system requirements. The suggestion presented in this paper is an improvement on the existing method for digital computation and results in a computing time reduction of approximately 50 to 70% when economic load scheduling is based on total generated power and 40 to 60% when based on total load. The proposed method uses exact penalty factors and loss-formula coefficients and takes the total generation or load requirements directly as input. An example comparing existing and proposed methods for calculating load scheduling is given, along with the computing times for each method.

R202416X67A

Akhtar, M Y
PROPOSED METHOD FOR ECONOMIC LOAD SCHEDULING
Proc, IEE, Engl, Vol 114, No 4, pp 525-531, Apr 1967. U of Adelaide, Australia, 7 p, 6 fig, 7 tab, 7 ref, append
DESCRIPTORS-- *electric power/ *electric power production/ electric power costs/ *electric power demand/ economics/ computer programming/ electrical engineering/ digital computers/ power system operations/ computation/ time
IDENTIFIERS-- *power dispatching/ operating costs/ power losses/ Australia/ foreign research

R202425X67A HIGH-VOLTAGE, HIGH-POWER LABORATORY

An independent organization tentatively named Electric Power Research and Development Center (EPRDC) is developing plans for a high-power, high-voltage, power system-based laboratory to be located at Grand Coulee, Wash. The proposed laboratory will be used by electric utility companies and educational institutions for research and development in the high-power, high-voltage transmission field. In conjunction with the laboratory, a graduate research center is proposed; it will be open to any university or college wishing to make use of the specialized facilities that will be available. Considerations involved in the preliminary design and advantages offered by such a comprehensive system-based laboratory are summarized. Existing high-power laboratories are reviewed, and EPRDC's objectives are outlined for this new facility. Site selection is discussed and reasons are given for proposing the Grand Coulee site. A description of the proposed laboratory and a block diagram showing its functional features are included.

R202425X67A

Szablya, J F and Lewis, W A
A COMPREHENSIVE HIGH POWER, HIGH VOLTAGE, POWER SYSTEM BASED LABORATORY
Paper 31 CP 67-539, IEEE Summer Pwr Mtg, Portland, Oreg, July 1967.
Washington State U, Pullman; Illinois Inst of Tech, Chicago, 16 p, 6 fig, 7 ref, 2 append
DESCRIPTORS-- *extra high voltage/ laboratories/ research and development/ *test facilities/ electrical industries/ transmission lines/ climatology/ *electric power// transmission /electrical// electric power production/ transportation/ costs/ electromagnetic properties/ automation/ education/ programs/ data collection systems/ data processing systems
IDENTIFIERS-- Coulee Dam, Wash/ operating costs/ site selection

R202426X67A COMPUTING TRANSMISSION SYSTEM RELIABILITY

A method of applying probability techniques to the analysis of transmission system reliability is presented. The method considers generation and transmission equipment performance, weather conditions, load cycles, generation dispatch, interconnections, and the effect of scheduled outages. A mathematical model has been developed to simulate the operation of a transmission system and to evaluate reliability. This model has been applied to study several specific portions of a system. Reliability of the transmission supply to several stations and reliability of the station supply to low-voltage buses are calculated. Included in the analysis is the effect on system reliability of performing scheduled outages according to certain specified policies.

R202426X67A

Mallard, Stephen A and Thomas, Virginia C
A METHOD FOR CALCULATING TRANSMISSION SYSTEM RELIABILITY
Paper 31 TP 67-501, IEEE Summer Pwr Mtg, Portland, Oreg, July 1967. Public Serv Elec & Gas Co, Newark, N J, 14 p, 6 fig, 5 tab, 8 ref
DESCRIPTORS-- *transmission /electrical// *reliability/ *systems analysis/ weather/ storms/ electrical equipment/ electric power failures/ *overloads/ electric power production/ maintenance/ mathematical analysis/ scheduling/ peak loads/ probability/ power system operations
IDENTIFIERS-- interconnected systems/ *outages/ mathematical models

R202427X67A NEW CONTROL SYSTEM FOR STATIC CONVERTERS

Static converters for hvdc transmission systems, based on mercury-arc valves or thyristors, are controlled by accurately timed firing pulses from a control system. The conventional control system has not been practicable for operating converters on a very weak a-c system, primarily because of harmonic instability caused by direct dependence of the control system on a-c line voltage and its distortion. A phase-locked oscillator-type pulse timing control system removes this direct dependence and makes possible the operation of converters on weak a-c systems, without harmonic instability. The basic principles of the system are described, discussed, and compared with other types of systems. Performance of the phase-locked oscillator control system under steady-state operation and effects of a-c system transients are reported. The system has been tested extensively on an hvdc simulator under conditions more stringent than on a real installation.

R202427X67A

Ainsworth, J D
THE PHASE-LOCKED OSCILLATOR--A NEW CONTROL SYSTEM FOR CONTROLLED STATIC CONVERTERS. Paper 31 TP 67-499, IEEE Summer Pwr Mtg, Portland, Oreg, July 1967. English Elec Co, Ltd, Stafford, G B, 9 p, 9 fig, 1 tab, 5 ref
DESCRIPTORS-- extra high voltage/ direct currents/ *rectifiers/ electric power// *converters /electrical// control/ alternating currents/ mercury/ *inverters/ electric arcs/ electric potential/ *oscillators/ frequency// filters /electromagnetic// attenuation/ transients/ amplifiers/ control systems/ electrical equipment
IDENTIFIERS-- *electric converter valves/ foreign research/ Great Britain/ harmonics/ short circuits

R202446X67A GENERATOR EXCITATION AND POWER SYSTEMS

A general survey of the various ways in which electric power system operation is affected by automatic excitation control of generators, with special emphasis on stability, is presented. Power system stability may be affected by a wide array of other influences; however, only excitation systems are discussed. Automatic voltage regulators, steady-state stability with and without automatic voltage regulators, stability power limits of long-distance transmission lines, excitation stabilizers, and influence of excitation system characteristics on stability are examined. Excitation system developments from 1946 to the present time are reviewed. Problems relating to transient stability and steady-state stability are evaluated. Special field tests on a cross-compound turbine-generator at the point of instability are used as an illustration of instability. Stability in a complex network has many aspects; however, the excitation system should be capable of responding properly to each problem as it arises and effectively damp all periods of oscillations which a generator may experience.

R202446X67A

Concordia, C and Temoshok, M
GENERATOR EXCITATION SYSTEMS AND POWER SYSTEM PERFORMANCE
Paper 31 CP 67-536, IEEE Summer Pwr Mtg, Portland, Oreg, July 1967.
General Elec Co, Schenectady, N Y, 21 p, 13 fig, 1 tab, 5 ref
DESCRIPTORS-- *excitation/ *electrical stability/ *electric generators/ transmission lines/ extra long distance/ voltage regulators/ research and development/ electric currents/ electric potential/ field tests/ computers/ *electrical networks/ electronic equipment/ characteristics/ simulation/ alternating currents/ automatic control/ *power system operations
IDENTIFIERS-- *transient stability/ excitation regulators/ dynamic stability/ *power system stability

R202447X67A UNDERFREQUENCY RELAYS FOR LOAD SHEDDING

When insufficient generation is available to meet load during severe emergencies, an automatic load shedding program throughout the affected area can prevent total system collapse. Through such a program, restoration of all affected loads is accomplished faster. Factors involved in applying underfrequency relays to achieve a desired deficient generation protection level and a method of calculating optimum settings for underfrequency relays are described. The application in substations throughout the load area of underfrequency relays, preset to drop specific percentages of load at predetermined low system frequency values, provides the simplest automatic load shedding program. Relay settings can be developed to drop the minimum load to arrest system frequency decay at a safe operating level. Additional underfrequency relays can be applied to initiate a safe and orderly system separation or shutdown if the emergency is beyond the capabilities of the load shedding program. Calculating procedures and sample calculations for relay setting coordination are given.

R202447X67A

Lokay, H E and Burtnyk, V
APPLICATION OF UNDERFREQUENCY RELAYS FOR AUTOMATIC LOAD SHEDDING
Paper 31 TP 67-447, IEEE Summer Pwr Mtg, Portland, Oreg, July 1967.
Westinghouse Elec Corp, East Pittsburgh, Pa, 10 p, 10 fig, 6 ref, 3 append
DESCRIPTORS-- *electric relays/ *frequency shifts/ overloads/ electrical engineering// failure /power// mathematical analysis/ electric power/ speed regulators/ *disturbances/ electric power production/ characteristics/ calculations/ coordination/ electrical stability/ *power system operations/ operations/ optimum design
IDENTIFIERS-- interconnected systems// *protection /electrical// tie lines/ spinning reserve/ *load shedding/ governors

R202448X67A PHASE-COMPARISON RELAYING FOR EHV LINES

Phase-comparison protection provides high-speed simultaneous fault clearing of all line terminals by utilizing a communications channel to compare the current phase positions at the ends of the line. Newly developed solid-state schemes applicable to long ehv lines with series capacitors are described. An improved sequence current filter converts the 3-phase line currents to 2 single-phase voltages; the voltage for phase comparison is a function of all 3 symmetrical components, while the second voltage output, insensitive to positive-sequence current, actuates a fault detector circuit. For the first time, digital logic circuits are using a frequency shift channel to allow phase comparison on both half cycles to minimize trip time. This dual-comparer principle is applicable to either a transfer-trip or power-line-carrier-blocking scheme. An improved all-static relaying scheme for ehv systems with series capacitors is described. This scheme uses the phase-comparison technique to solve the negative reactance problem introduced by series capacitors. A historical review of developments in the evolution of the phase-comparison principle is given.

R202448X67A

Rockefeller, G D
PHASE-COMPARISON RELAYING FOR EHV LINES
Paper 31 CP 67-458, IEEE Summer Pwr Mtg, Portland, Oreg, July 1967.
Westinghouse Elec Corp, Newark, N J, 10 p, 10 fig, 2 tab
DESCRIPTORS-- *electric relays/ *extra high voltage/ frequency shifts/ electric power/ alternating currents/ electric potential/ power system operations/ powerline carriers/ electrical stability/ solid state physics/ capacitors/ capacitance// faults /electrical// communications/ attenuation/ electromagnetic shielding/ microwaves/ rectifiers/ amplifiers/ electrical equipment/ *transmission lines/ phase control
IDENTIFIERS-- *protection /electrical// transfer tripping/ reactance

R202475X67A TRANSMISSION LINE TOWER ARRANGEMENT

A dynamic computer programming procedure to select sites and heights of towers in an overhead electric power transmission line is described. Use of this procedure minimizes construction costs, yet satisfies physical constraints. Once the route for a transmission line has been established and divided into straight sections, assuming that tension towers are fixed at each end, the procedure analyzes each straight section to determine the most economical spacing, height, and location for suspension towers. The procedure was applied to a stretch of 275-kv line, 10,975 feet long; results compared favorably to those obtained by current practice implemented on the line. Several possible extensions of the method are suggested.
R202475X67A

Ranyard, J C and Wren, A
THE OPTIMUM ARRANGEMENT OF TOWERS IN AN ELECTRIC POWER TRANSMISSION LINE
The Computer Jour, Vol 10, No 2, pp 157-161, Aug 1967. U of Leeds, G B, 5 p, 1 fig, 5 ref
DESCRIPTORS-- *transmission towers/ *transmission lines/ electric cables/ *computer programming/ *locations/ spans/ structural engineering/ tension/ clearances/ terrain/ cost comparisons/ electric power/ electrical engineering/ foreign design practices/ computers
IDENTIFIERS-- *computer tower position/ comparative studies/ Great Britain/ electric conductors

R202477X67A SIMPLIFIED LOAD FLOW

A simplified load flow program for use on a digital computer provides a solution to real power network flow with a high degree of accuracy and reduced computer running time. The program is designed to analyze real and reactive power flow simultaneously and provide system voltage control by load tap changing transformers or varying reactive output of system generators. The program explores and develops transmission associated with future generating capacity on complex a-c power network systems and supplies power flow answers in mw for a given system with a high degree of accuracy, with much less running time and considerably less input data than is required for an a-c load flow program. The program, as outlined, is capable of solving a network system of 360 buses and 585 lines. A computer flow diagram and a single-line representation of a 21-bus test system is given.
R202477X67A

Bonaparte, J E and Maslin, W W
SIMPLIFIED LOAD FLOW
Paper, IEEE 1967 PICA Conf Record, pp 385-394, Pittsburgh, Pa, May 1967. Philadelphia Elec Co, Pa, 10 p, 7 fig, 1 ref, append
DESCRIPTORS-- electric power/ *power system operations/ digital computers/ *electric power demand/ systems analysis/ computer programming/ economies/ *electrical networks/ electric power production/ public utilities/ electric power industries/ operations/ benefits// transmission /electrical// scheduling/ coordination/ planning
IDENTIFIERS-- cost savings/ generating capacity/ interconnected systems/ power grids

R202478X67A INVESTMENT DECISIONS & EXPANSION PLANNING

Typical long-range investment problems in the power industry include uncertainties in forecasts concerning load growth, fuel prices, availability and cost of capital, nuclear fuel cycle costs, investment consumption for different types of nuclear reactors, and possible innovations. These and many other variables are different functions of time and are described as stochastic variables. From the planner's point of view, each of the variables is regarded as a best guess and a frequency curve for a given time period. A new computation procedure approximating frequency curves of the variables to a 5-step curve to shorten computer time is discussed. In the system expansion procedure, making successive decisions in time is necessary where a decision 5 yr later is dependent on installations made 5 yr earlier or on the outcome of independent and dependent variables in the intervening time. Also, an earlier decision is likely to be suboptimum in light of the new information. The proposed program represents an economic model of the economic reality in which we live and make decisions, even if the decisions must be based on incompetent or incomplete opinions having many variables.

R202478X67A

Ryman, Jan-Erik and Lindstroem, Goeran
GENERAL EXPANSION PLANNING--LONG RANGE INVESTMENT DECISIONS WITH DIFFERENT ALTERNATIVES AND UNCERTAINTIES IN THE BASIC DATA (WITH SPECIAL REFERENCE TO THE VERY LONG RANGE PLANNING OF POWER SYSTEMS). Paper, IEEE 1967 PICA Conf Record, pp 459-477, Pittsburgh, Pa, May 1967. AB Skandinaviska Elverk, Stockholm, Sweden, 19 p, 10 fig, 5 tab, 6 ref, append
DESCRIPTORS-- *decision making/ *planning/ *electric power production/ resources/ calculations/ *optimum development plans/ computer programming/ electric power industries/ probability/ hydroelectric power/ economics/ nuclear powerplants/ thermal power/ capital costs// interest /finance/
IDENTIFIERS-- stochastic models/ foreign research/ long-term planning/ Sweden/ investment/ fuel costs

R202479X67A PERFORMANCE OF ELECTRIC POWER SYSTEMS

A new digital computer stability program capable of representing 1000 buses, 2000 lines, and 250 machines permits analysis of large interconnected power systems. The detail in which load and machine characteristics can be represented in the program allows calculations resulting in accurate predictions of power system behavior under dynamic conditions. These predictions are becoming more and more important as areas of interconnected systems increase in number and expand in size. A discussion of the philosophy associated with the evolution of the program and the features and representations incorporated therein is included.

R202479X67A

Young, C C and Webler, R M
A NEW DIGITAL COMPUTER PROGRAM FOR PREDICTING DYNAMIC PERFORMANCE OF ELECTRIC POWER SYSTEMS. Paper, IEEE 1967 PICA Conf, pp 21-29, Pittsburgh, Pa, May 1967. General Elec Co, Schenectady, N Y, 9 p, 11 fig, 2 ref
DESCRIPTORS-- *electric power/ *electrical stability/ *computer programming/ characteristics/ digital computers/ systems analysis// bus /electrical// calculations/ forecasting/ generators/ transmission lines/ machines/ circuits/ control systems/ feasibility studies/ disturbances/ excitation/ damping/ loads/ turbines/ simulation/ power system operations
IDENTIFIERS-- *interconnected systems/ *power system stability/ impedance/ *performance/ problem solving/ power grids

ELECTRIC POWER

R202480X67A OPTIMUM LOADING OF HYDROPLANT UNITS

At a hydroelectric power station containing several turbines, water required for a given power output can be minimized by the correct choice of the number of units and division of water among the different types. In a mixed hydrosteam system such as Ontario Hydro, this can result in substantial savings of fuel costs. A computer program has been written to produce tables and graphs, smoothed out for ease of operation, to show optimum water usage. Another program compares actual operation with the optimum. Use of these programs is already saving about $11,000/mo; when applied to all of Ontario Hydro's hydroelectric stations, an estimated minimum of $200,000/annum should be saved. The computer program, formulation of the basic optimum loading table, method of smoothing operation, and a performance review program are discussed. Examples of optimum loading curves and a final optimum loading table are included.

R202480X67A

Aitchison, A; McNamee, J M; Spence, M V, et al
OPTIMUM LOADING OF HYDROPLANT UNITS
Paper, IEEE 1967 PICA Conf Record, pp 177-188, Pittsburgh, Pa, May 1967. Waterloo U, Canada; Hydro Elec Pwr Comm of Ontario, Canada, 12 p, 6 fig, 4 tab, 2 ref
DESCRIPTORS-- hydroelectric powerplants/ *optimum use/ thermal powerplants/ *electric power production/ computer programming/ foreign design practices/ economies/ water utilization/ curves/ algorithm/ electric power/ costs/ electrical networks/ peaking capacities/ *power system operations/ curve fitting/ electric power demand
IDENTIFIERS-- Ontario Hydroelectric Comm/ *optimum loading/ cost savings/ fuel costs/ Canada

ELECTRICAL ENGINEERING

R202412X67A LIGHTNING AND TRANSMISSION LINES

The phenomenon of natural lightning is of interest to many people in varied diciplines; among them are meteorologists, physicists, and radio and power transmission engineers. The power transmission engineer limits his attention largely to aggregate or terminal effects and, in consonance with his knowledge of the equipment he must protect, attempts to understand and explain the lightning stroke by analogy with corona and breakdown characteristics of rod gaps and parallel conductors. The author discusses lightning components, stroke probability and density, surge impedance and potential of stroke, transmission line shielding, direct and indirect strokes, prestrike theory, difficulties of computations, and pipe-pipe gaps. Much detailed information concerning characteristics of individual strokes has been obtained, and new data are continually being accumulated. For substantially perfect shielding, protective angles of 45, 30, and 12 deg are required for ground wire heights of 50, 100, and 150 ft; for direct strokes to the ground wire, AIEE working curves and their extensions to higher voltages seem to be adequate. Has 66 references.

R202412X67A

Wagner, C F
LIGHTNING AND TRANSMISSION LINES
Jour of Franklin Inst, Vol 283, No 6, pp 558-594, June 1967. Westinghouse Elec Corp, East Pittsburgh, Pa, 37 p, 29 fig, 1 tab, 66 ref
DESCRIPTORS-- *lightning/ *transmission lines/ electrical engineering/ *electric arcs/ characteristics/ electric currents/ laboratory equipment/ laboratory tests/ oscillographs/ shielding/ electric potential/ footings/ transmission towers/ computation/ bibliographies
IDENTIFIERS-- air gaps/ polarity/ overhead ground wire/ *electric discharges/ *voltage gradients/ *flashover// earth resistivity /elect// electrical insulators

R202415X67A CALCULATING LINE SWITCHING TRANSIENTS

Calculating transient overvoltages caused by circuit breaker operations in loaded power systems has always been important. In the past, however, attention was focused mainly on the restriking voltage transient occurring when a circuit breaker opens, since this directly affects the circuit breaker duty and design. The rise in system operating voltages and the desire to keep capital costs low by reducing the system insulation level have led to investigations of methods for calculating transient overvoltages caused by switching long extra-high-voltage transmission lines. There are a number of methods for calculating switching transients; however, the most accurate may not be justified because of system-data limitations and greater computation costs. The paper reviews 3 methods for calculating transient overvoltages with the digital computer and describes facilities available in a program based on the lattice-diagram method of solution of the traveling-wave equations. The lattice-diagram method is used to examine the relative effect of various factors in the insulation coordination of a transmission line. Has 17 references.

R202415X67A

Bickford, J P and Doepel, P S
CALCULATION OF SWITCHING TRANSIENTS WITH PARTICULAR REFERENCE TO LINE ENERGISATION. Proc, IEE, Engl, Vol 114, No 4, pp 465-477, Apr 1967. AEI Pwr Systems Engg Dept, Manchester, G B; Elec Supply Comm, S Africa, 13 p, 21 fig, 2 tab, 17 ref, append
DESCRIPTORS-- *extra high voltage/ *transmission lines/ calculations/ *transients/ circuit breakers/ electric insulation/ reliability/ electric potential/ electric currents/ electrical engineering/ resistors/ Fourier analysis/ electric shunts/ capacitance/ electrical impedance/ digital computers/ bibliographies
IDENTIFIERS-- *switching surges/ *overvoltage/ electrical restrikes/ electrical design/ *lattice-diagram method

R202421X67A SUPERCONDUCTING CABLE--PREDICTED DESIGNS

Superconductors offer a cable system which eventually may be more economical than conventional cable. Although cost is the main criterion, technical features affect the incorporation of superconductors into any system; they afford low-temperature electrical insulation leading to an a-c cable relatively free of dielectric losses and having low electrical capacitance. Thus, long lengths can be built without a high reactive current component, eliminating the compensating inductive reactors now needed for long runs. Research over the past 8 yr has resulted in 3 major developments: helium is more available; engineering techniques for low-temperature refrigerators have improved; and alloys and compounds for superconductors carrying high-current densities in high-magnetic fields have been discovered. Properties of high-current superconductors are discussed, and several insulants are considered as possibilities at low temperatures. Estimates of relative costs and details of the first designs for 750-mva, 33-kv a-c and 750-mva, 100-kv d-c cables are given.

R202421X67A

Norris, W T and Swift, D A
DEVELOPMENTS AUGUR DESIGN OF SUPERCONDUCTING CABLES
Elec World, Vol 168, No 4, pp 50-53, July 1967. CEGB, Leatherhead, G B, 4 p, 4 fig, 2 tab
DESCRIPTORS-- *electric cables/ research and development/ *cryogenics/ electric insulation/ capacitance/ energy losses/ electric currents/ alloys/ overloads/ refrigerators/ magnetic fields/ thermal insulation/ aluminum/ *helium/ nitrogen/ vacuum/ copper/ electrical engineering// transmission /electrical// electric power/ electric potential
IDENTIFIERS-- *superconductors/ dielectric properties/ dielectric absorption/ short circuits/ electrical resistance/ critical temperature

R202424X67A EARTH RESISTANCE OF DRIVEN-ROD ELECTRODES

Based on the concept that an electrode and the equipotential surfaces surrounding it are similar in shape, a new method for determining earth resistance of a single-rod electrode is presented. Analysis of the potential field is then extended to evaluate earth resistance of multiple-driven-rod-electrode systems. This analysis also substantiates that the current electrode need not be kept at a great distance from the earth electrode when experimentally determining earth resistance by the fall-of-potential method. A modification of the normal method is suggested, and a curve for accurate determination of earth resistance is given. Validity of this analysis was tested by extensive field experiments and the use of an electrolytic tank. Close agreement between test results and computed values provides evidence supporting the basic assumption of equipotential surfaces.
R202424X67A

Datta, M; Basu, A K; Chowdhury, M M Roy
DETERMINATION OF EARTH RESISTANCE OF MULTIPLE DRIVEN-ROD ELECTRODES
Proc, IEE, Engl, Vol 114, No 7, pp 1001-1006, July 1967. Indian Inst of Technol, Kharagpur, India, 6 p, 8 fig, 4 tab, 4 ref
DESCRIPTORS-- *electrical grounding/ electric potential/ *electrodes/ *electrical resistivity/ electric currents/ experimental data/ *electrical engineering/ inductance/ capacitance/ resistivity surveys
IDENTIFIERS-- *earth resistivity /elect// ground currents/ electrical resistance/ foreign research/ India

R202474 67A CORONA-CAUSED RADIO INTERFERENCE FROM EHV

A mathematical model of corona on transmission lines is coupled with an assumed statistical time distribution of corona sources, leading to a method for calculating the corona-caused electric field and evaluating radio reception quality. The problem of corona-caused radio interference (RI) has received much attention from designers of ehv transmission systems. Conductor surface blemishes increase the field intensity around the conductor and contribute to a rise in the RI level, varying directly with electric field strength. In addition to surface condition, the environment surrounding conductors significantly affects RI. Although useful analytical data can be generated to assist in the design of ehv systems, such information must be supplemented with experimental data obtained from actual systems operating under realistic conditions. Development of the theory and calculation of corona-caused RI, as reported by IEEE publications over the past 11 yr, is summarized.
R202474 67

Smith, Richard T
THEORY AND CALCULATION OF CORONA-CAUSED RADIO INTERFERENCE FROM EHV LINES--PART I. Paper, 19th Ann Southwestern IEEE Conf & Exhib, pp 13-4-1 thru 13-4-8, Dallas, Tex, Apr 1967. U of Oklahoma, Norman, 8 p, 12 ref
DESCRIPTORS-- *electrical coronas/ *radio interference/ extra high voltage/ transmission lines/ electric power/ environment/ *radio reception/ electric fields/ mathematical analysis/ statistical analysis/ dielectrics/ capacitance/ attenuation/ electrostatics
IDENTIFIERS-- *electric conductors/ electric discharges/ electrical design

R202417 67A GROUTING OF DAM FOUNDATIONS IN ROCK

During construction of dams in the Ruhr district of West Germany, the question of permeability and grouting of solid rock as a function of the geological conditions was examined. The most reliable method for determining permeability was found to be the water pressure test with packer. Under certain geological conditions, determining the average values of permeability coefficient as a function of water absorption in the water pressure test was possible. When grouting the basement rock, adaptation of drilling direction and grout composition to textural and structural features of the rock was necessary. Conditions are explained with examples from the Henne, Sorpe, and Bremge Dams. In contrast to the opinion of Casagrande, the author proves that in an anisotropic and nonhomogeneous rock, sufficient sealing of the rock foundation is obtainable with a one-row grout curtain. For planning foundation grouting for normal geologic conditions, a set of curves showing the permissible absorption of water in relation to pressure at different water storage levels was developed from the reported investigations.

R202417 67A

Heitfeld, Karl Heinrich
THE PROBLEM OF GROUTING IN DAM CONSTRUCTION
Die Wasserwirtschaft, Vol 56, No 11, pp 366-369, 1966. Transl from German, USBR Transl 729, July 1967, 14 p, 2 fig, 2 tab, 8 ref
DESCRIPTORS-- *grouting/ *dam foundations/ *rock foundations/ water cement ratio/ permeability/ cement grouts/ grout curtains/ foreign construction/ *field permeability tests/ underseepage/ uplift pressures/ rocks/ geology/ foundation investigations/ strata/ solubility/ engineering geology/ drill holes/ slates
IDENTIFIERS-- Ruhr Region, Germany/ Germany// packers /grouting// Sorpe Dam, Germany/ Bremge Dam, Germany/ Henne Dam, Germany

R202443X67A UPLIFT CAPACITY OF SHALLOW FOUNDATIONS

Ontario Hydro's experience in designing tower foundations to resist uplift loading is discussed. Details of field and laboratory tests conducted and a comparison of the results with those reported by others are included. The general behavior of soil subjected to uplift loading is considered, and an approximate general solution for short- and long-term loading is presented. A review of previous theories and experience within Ontario Hydro had shown a lack of any generally accepted theory; therefore, simple model tests were carried out in loose and dense sands and soft and stiff clays for various anchor depth-to-width ratios. In sand, the failure mechanism was found to be influenced significantly by the surface boundary and relative density of the soil; in clays, negative pore-water pressures were observed, accounting for a large reduction in the uplift resistance under sustained loading. Simple design relationships for sand and clay were produced from the model tests; values calculated from these relationships showed reasonable agreement with results of full-scale tests on undercut augered concrete footings. More rigorous solutions are needed, however, to enable estimation of footing movements under vertical and lateral loads.

R202443X67A

Adams, J I and Hayes, D C
THE UPLIFT CAPACITY OF SHALLOW FOUNDATIONS
Ontario Hydro Res Quar, Vol 19, No 1, pp 1-13, 1st Quar 1967. 13 p, 12 fig, 3 tab, 12 ref
DESCRIPTORS-- *transmission towers/ *foundations/ foundation failures/ foundation investigations/ model tests/ *footings/ uplift pressures/ sands/ clays/ negative pore pressures/ relative density/ vertical loads/ theory/ shear strength/ coefficients/ foreign design practices
IDENTIFIERS-- belled footings/ *pull-out tests/ uplift footings/ Canada/ *uplift resistance/ auger-type footings/ failure surfaces/ Ontario Hydroelectric Comm

R202411 58A DYNAMIC STRUCTURE OF MUDFLOWS

Artificial mudflow studies conducted in the USSR over a 4-yr period are reported. An inexpensive method of scouring exploration trenches for geologic investigations created artificial mudflows. These flows were studied to investigate the dynamic structure of mudflows in the field. By discharging surges of water down a hillside through a 20- by 20-cm channel, the mudflows were produced. The first release of water washed out some of the sediments and wet the channel bed to a depth of 40 to 60 cm. Later, successive releases of 25 to 40 cu m of water initiated the mudflows. As the water encountered and displaced coarse detrital material, the flow separated into several waves, each having mudflow characteristics. The dynamics of mudflow structure are discussed, and the author concludes that mudflows can be controlled safely by capture in pits or by barrages. Terraces formed by the barrages are not dangerous and have possible use as garden areas or building sites.

R202411 58A

Ivanov, G V
NEW DATA ON THE DYNAMIC STRUCTURE OF MUDFLOWS
Bull of Moscow Soc for Natl Res, Geol Sec, Vol 33, No 1-3, pp 106-121, 1958. Transl from Russ, CFSTI Transl TT 65-50093, 16 p, 4 fig, 10 ref
DESCRIPTORS-- *mudflows/ dynamics/ detritus/ *engineering geology/ geologic investigations/ alluvial deposits/ trenches/ control structures/ dams/ deposition/ terraces/ channeling/ scour/ waves/ sediment transport/ hydraulic excavation
IDENTIFIERS-- barriers/ foreign research/ USSR/ barrages

R202483 67A SEISMIC PROPERTIES OF A FRIABLE MEDIUM

Knowledge acquired from numerous strong earthquakes discloses certain consistent seismic characteristics for friable ground: (1) The uppermost portion of the ground strongly influences the seismic effect, (2) a rigid surface layer situated on more friable layers decreases the seismic effect on structures, (3) ground water amplifies the seismic effect, and (4) seismic effect for flooded ground is lesser than for moist ground. Classical elastic wave theory does not explain these phenomena satisfactorily. The concept of friability is reviewed and an elastic model of a friable medium proposed. Some simple cases of elastic wave propagation in a friable medium are considered, and experimental methods for friable ground studies leading to a better understanding of wave propagation and microseismic zoning are outlined.

R202483 67A

Nikolaev, A V
THE SEISMIC PROPERTIES OF A FRIABLE MEDIUM
Physics of Solid Earth, Vol 3, No 2, pp 85-90, Feb 1967. Izv, Acad of Sci, USSR, 6 p, 4 fig, 8 ref
DESCRIPTORS-- *geophysics/ *seismic investigations/ *seismic properties/ seismic waves/ seismology/ *earthquakes/ wave velocity/ elasticity/ ground water/ granular materials/ longitudinal waves/ soil moisture/ transverse waves/ boreholes/ vibrations/ *noncohesive soils
IDENTIFIERS-- elastic waves/ *wave propagation/ foreign research/ USSR/ mathematical models

R202419X67A WALL JETS IMPINGING ON ROUGH BOUNDARIES

Plane turbulent wall jets, similar to those occurring under high-head sluice gates, were studied under zero pressure gradient on rough boundaries. Six types of rough boundaries with relative roughness factors varying from 0.00455 to 0.126 were investigated. For the major part of the boundary layer, velocity distribution is correlated by the velocity defect law. In a power law-type equation for the velocity distribution, the exponent is found to vary from 1/2 to 1/8 for the range studied. Boundary layer growth is correlated roughly by the Bauer method for studying boundary layer development of spillways. In the fully developed zone, velocity distribution in the entire wall jet cannot be described by a single-length scale; the wall jet must be divided into a boundary layer and free-mixing region. The modified velocity distribution curve of the classical wall jet successfully describes velocity distribution in the free-mixing portion of wall jets with rough boundaries. The length scale is found to be unaffected by rough boundaries which considerably affect decay of the maximum velocity. Using the distance from the efflux section for a given relative roughness, a method for predicting decay of the maximum velocity was developed. Flow entrainment, momentum fall, and energy fall in the flow below a high-head sluice gate with a rough bed were studied also. Has 30 ref.

R202419X67A

Rajaratnam, N
PLANE TURBULENT WALL JETS ON ROUGH BOUNDARIES
Water Pwr, Vol 19, No 4-6, pp 149-153, 196-201, 240-242, Apr-June 1967.
U of Alberta, Canada, 14 p, 23 fig, 1 tab, 30 ref
DESCRIPTORS-- submerged orifices/ submergence/ turbulence/ *sluice gates/ turbulent flow/ hydraulics/ *hydraulic gates and valves/ boundary layer/ boundaries/ roughness coefficients/ velocity distribution/ *jets/ wire/ *slide gates/ roughness/ laboratory tests/ hydraulic laboratories/ flow resistance/ water surface profiles/ Reynolds number/ relative roughness/ bibliographies
IDENTIFIERS-- *wall jet/ *submerged flow/ mesh reinforcement

R202428 67A FRIANT-KERN CANAL FLOW MEASUREMENT

Radioisotope discharge measurements were performed on 2 sections of the Friant-Kern Canal during the period August 10-14, 1964, to determine water losses in the canal. A concrete-lined section between Friant Dam and Mile 29 and an earth-lined section between Mile 35 and Mile 53 served as the test reaches. Eight radioisotope injections were made, resulting in 24 individual discharge rate determinations. The discharge values obtained with the radioisotope measurements ranged from 2643 to 3128 cfs and were compared to the results of current meter measurements and the discharges indicated by calibrated hollow-jet valves at Friant Dam. Measurement accuracies based on the above comparison were all within 9.5%, but many were within 2%. The integrated sample and total count methods were used to determine the discharge with radioisotopes. A waterproof scintillation counter and 2 Geiger counters were used in the tests. New methods of field calibration of the immersed counter were tested successfully to calibrate the scintillation counter.

R202428 67A

Hansen, Robert L
RADIOISOTOPE DISCHARGE MEASUREMENTS ON THE FRIANT-KERN CANAL, CENTRAL VALLEY PROJECT, FRESNO, CALIFORNIA. USBR Lab Rept ChE-41, Chem Engg Br, June 1967. Bureau of Reclamation, Denver, Colo, 24 p, 3 fig, 6 tab, 6 ref
DESCRIPTORS-- gamma rays/ half life/ radiation hazards/ radiation measurement/ radioactive decay/ *radioactive isotopes/ current meters/ mixing/ *discharge measurement/ *tracers/ counting method/ calibrations/ Geiger counters/ injection/ water sampling/ seepage losses/ *canal seepage/ public health/ *water measurement
IDENTIFIERS-- gold isotopes/ scintillation counters/ total count method/ lined canals/ Friant-Kern Canal, Calif/ Central Valley Proj, Calif/ *flow measurement

R202441X67A CORRELATION OF UNIFORM PIPE FLOW DATA

The theory of correlation of uniform flow resistance data for pipes, based on the concept of dynamic velocities, is discussed. A definitive study of arrangements of diagrams gives direct solutions of flow problems. After review of past work, some new forms of diagrams are given; one is based on the familiar Stanton diagram, providing direct dimensionless solutions for all forms of the problem. Amplification of the Stanton diagram permitting dimensional working is illustrated. Assigning equivalent sand roughness sizes to particular surfaces without the Nikuradse test range of relative roughness, or extrapolating from the Nikuradse test range to larger values of relative roughness using a logarithmic formula, is not presently justifiable; thus, generation of data for resistance charts by the Colebrook-White formula is suspect. Diagrams depending largely on the equivalent sand roughness sizes as a linear measure, such as Powell's and Acker's diagrams, and 2 of the author's new diagrams, eventually may require modification. On the author's Stanton diagram-based arrangement, the physical significance of the interrelation of the variables is highlighted, and modification of the single diagram for dimensionless and dimensional application will not present great difficulty. Has 21 references.

R202441X67A

Barr, David Ian Hunter and Smith, Alan Andrew
APPLICATION OF SIMILITUDE THEORY TO CORRELATION OF UNIFORM FLOW DATA
Proc, Inst Civ Engrs, Engl, Vol 37, Session 1966-67, pp 487-509, July 1967.
U of Strathclyde, G B, 23 p, 14 fig, 2 tab, 21 ref
DESCRIPTORS-- *steady flow/ *pipelines/ correlation techniques/ hydraulics/ *flow resistance/ roughness coefficients/ closed conduits/ closed conduit flow/ *pipes/ charts/ *fluid flow/ fluid friction/ head losses/ Reynolds number/ bibliographies/ hydraulic similitude
IDENTIFIERS-- Nikuradse/ *similitude/ Colebrook-White formula/ pipe design/ *uniform flow// friction coefficient /hyd// Stanton diagram

R202451 67A SCOURING CAPACITY OF AIR-WATER JETS

Passage of a jet through air can cause air entrainment leading to differences in scouring capacity of the jet. During spillway model studies, differing indications of scour depth, in the ratio of 2:1, have been attributed to this effect. To examine the magnitude of air entrainment effects, a series of tests were undertaken on a specially designed installation. The apparatus comprised an 8-cu m tank, 1 m deep, containing gravel; a vertical jet nozzle set above it; and water and air supply and measuring systems. The semicircular jet nozzle was mounted with its flat side flush with the inner face of a transparent wall of the tank. Flow, air content, tailwater depth, and flow duration were varied and the effects noted on rate and depth of scour. A typical comparison of scour depth-tailwater depth relationships is shown for the plain jet, split jet, and aerated jet. Variation in jet penetration with tailwater at different jet discharges is shown for a plain water jet and an air-water jet. Formulas for predicting scour at the base of a free overfall are compared graphically with the test results; the observed correlation is discussed. The time function of scour is considered and a dynamic scour depth limit is differentiated from the more common static limit.

R202451 67A

Johnson, Geoffrey
THE EFFECT OF ENTRAINED AIR ON THE SCOURING CAPACITY OF WATER JETS
Proc, 12th Cong of IAHR, Vol 3, pp 218-226, Fort Collins, Colo, Sept 1967.
SOGREAH Hyd Lab, Grenoble, France, 9 p, 4 fig, 6 ref
DESCRIPTORS-- *scour/ *air entrainment/ *spillways/ aeration/ backwater/ gravels/ laboratory tests/ hydraulic models/ nozzles/ energy dissipation/ time/ streambeds/ *jets/ *stilling basins
IDENTIFIERS-- *tailwater/ impinging flow/ depth

R202455 67A RADIAL DIFFUSION IN TURBULENT PIPE FLOW

Some of the parameters affecting radial diffusion are discussed. The analogy between the radial diffusion coefficient and the eddy viscosity is used to obtain an equation for calculating the diffusion coefficient K. Analytical concentration distributions are presented for steady-state diffusion from a source on the centerline of the pipe. The analytical distributions are used to calculate empirical K-values. Forty K-values from various sources are presented. These data show that: (1) the amount of lateral spread of the diffusing substance in the pipe has a significant effect on the value of K, and (2) the analogy of diffusion with the eddy viscosity is a fair approximation for K when the diffusing substance fills the pipe cross section. An equation is derived for estimating the distance required for complete mixing in uniform pipe flow. Has 16 references.

R202455 67A

Holley, Edward R and Schuster, Jack C
RADIAL DIFFUSION IN TURBULENT PIPE FLOW
Proc, 12th Cong of IAHR, Vol 4, pp 124-136, Fort Collins, Colo, Sept 1967. U of Illinois, Urbana; Bureau of Reclamation, Denver, Colo, 13 p, 4 fig, 1 tab, 16 ref
DESCRIPTORS-- *closed conduit flow/ *pipes/ bibliographies/ *turbulence/ tracers/ radioactive isotopes/ *turbulent flow/ hydraulics/ closed conduits/ pipelines/ mixing/ eddies/ *diffusion/ flow diagrams
IDENTIFIERS-- *radial diffusion/ diffusion coefficient

R202456 67A HYDRAULIC RADIUS AND OPEN CHANNEL FLOW

The validity of applying the hydraulic radius as a sole geometric quantity for various channel shapes in computing turbulent uniform flow is discussed. Flows in smooth rectangular channels of 0.24 and 0.75 ft in width were analyzed for aspect ratios ranging from about 0.5 to 10. Data collected from the two channels for mild and steep slopes are presented in graphical form and mostly as dimensionless parameters; i.e., friction factor, Reynolds number, modified Reynolds number, and aspect ratio of rectangular channels. Results show that for a given hydraulic radius, channel slope, and roughness, the increase in mean velocity of turbulent uniform flow or the decrease in flow resistance is attributed to the lowering aspect ratio. This trend toward less flow resistance appears to be more evident for the mild slope than the steep slope. Conclusions were: (1) application of the hydraulic radius in uniform flow analysis is valid if the aspect ratio is greater than about 2; (2) use of the hydraulic radius should be coupled with consideration of the effect of channel shape if the aspect ratio is less than about 2; and (3) relationship between the friction factor and the modified Reynolds number is more suitable for use with the Darcy-Weisbach uniform flow formula.

R202456 67A

Shih, Cornelius C and Grigg, Neil S
A RECONSIDERATION OF THE HYDRAULIC RADIUS AS A GEOMETRIC QUANTITY IN OPEN CHANNEL HYDRAULICS. Proc, 12th Cong of IAHR, Vol 1, pp 288-296, Fort Collins, Colo, Sept 1967. U of Alabama, Huntsville; Colorado State U, Fort Collins, 9 p, 7 fig, 12 ref
DESCRIPTORS-- *open channel flow/ open channels/ *hydraulic radius/ slopes/ turbulent flow/ *rectangular conduits/ shapes/ roughness/ roughness coefficients/ Reynolds number/ hydraulics/ laboratory tests/ hydraulic models
IDENTIFIERS-- aspect ratio// friction coefficient /hyd// Darcy-Weisbach formula

R202457 67A FLOOD CONTROL CHANNEL HYDRAULICS

Concrete-lined open channels have been used frequently to control floods on steep gradient streams in highly developed industrial and urban areas of the U S. Gradients of the streams ranged from 25 to 200 ft per mi and produced eroding velocities in the natural channels. Methods are described for resolving some of the problems encountered when: (1) high-velocity flow traverses short radius curves in both rectangular and trapezoidal channels and (2) two high-velocity tributary flows join at a confluence. Illustrations of prototype and model installations are given for designs used in the construction of flood control channels by the Corps of Engineers in Southern Calif.

R202457 67A

Gildea, Albert P and Wong, Ralph F
FLOOD CONTROL CHANNEL HYDRAULICS
Proc, 12th Cong of IAHR, Vol 1, pp 330-337, Fort Collins, Colo, Sept 1967.
U S Army Corps of Engrs, Los Angeles, Calif, 8 p, 12 fig, 1 tab
DESCRIPTORS-- *flood control/ *channels/ *open channels/ *open channel flow/ rectangular conduits/ trapezoidal channels/ supercritical flow/ urban areas/ turbulent flow/ curves/ hydraulic models/ inlets/ sediment control/ design criteria/ *channel improvements/ hydraulics
IDENTIFIERS-- high velocity/ superelevation/ confluence/ California

R202471 67A ACOUSTIC VELOCITY METER

The acoustic velocity meter measures the flow of water through pipes, stream channels, or other conveyances by means of sound waves. Water velocity is determined by measuring the transit time of an acoustic signal through flowing water. The velocity of the signal is the algebraic sum of the velocity of sound in still water and the component of water velocity as measured along the acoustic path; average velocity and total flow are easily obtained mathematically. The device does not interfere in any way with the flow of water and is a logical instrument for water measurement where head is not proportional to flow, as in weir-controlled canals, tidal estuaries, pipes, submerged stream gaging stations, and pumped storage interconnections. This system is the main hope for measuring net outflow from the Sacramento-San Joaquin Delta. Acoustic velocity meter systems developed by Westinghouse, Lockheed, and USGS are reviewed.

R202471 67A

Huffman, Elmo W
THE ACOUSTIC VELOCITY METER
Tech Memo 24, California Dept of Water Resrcs, Sacramento, July 1967.
30 p, 5 fig, 5 ref
DESCRIPTORS-- *flow meters/ fluid flow/ velocity/ *velocity meters/ *water meters/ acoustic equipment/ sonic waves/ *water measurement/ measuring instruments/ instrumentation/ transducers/ ultrasonics/ underwater sound/ electronics/ electronic equipment/ hydraulics
IDENTIFIERS-- flow measurement/ ultrasonic flow measurement/ acoustic velocity meters

R202472 67A CAVITATION IN HORIZONTAL PIPELINES

HYDRAULICS

The phenomenon of cavitation in a horizontal pipeline, emphasizing the influences of compressibility of water and force of gravity on the formation and spreading of a cavity, is described. This cavitation is considered a particular case of water hammer. If pressure somewhere in a pipeline is reduced to a value which would induce cavitation, a cavity will form at the reduced pressure location. If the cavity then collapses, the collapse may be accompanied by extremely high pressures. In practice, such phenomena may occur in pipelines when supply pumps suddenly stop. From the general equation of continuity and both equations of motion, a system of equations is derived having the same form inside and outside the cavitation region. A numerical method for a step-by-step solution of the equations is presented.

R202472 67A

Siemons, J
THE PHENOMENON OF CAVITATION IN A HORIZONTAL PIPE-LINE DUE TO A SUDDEN PUMP-FAILURE. Jour of Hyd Res, Vol 5, No 2, pp 135-152, 1967. Delft Hyd Lab, Delft, Netherlands, 18 p, 12 fig, 1 tab, 5 ref
DESCRIPTORS-- *cavitation/ *cavities/ *pipelines/ mathematical analysis/ motion/ *water hammer/ water pressures/ waves/ disturbances/ velocity/ two-dimensional/ flow/ fluid friction/ finite differences/ hydraulics/ numerical method/ closed conduit flow/ pumps
IDENTIFIERS-- *water column separation/ foreign research/ Netherlands/ *boundary conditions

R202430X67A BANK STABILIZATION USING STEEL JACKS

HYDROLOGY

Several test sections were constructed to determine the best method of controlling bank erosion along the Frenchman River in Nebraska. After 3 yr of observing these test sections, the following conclusions were drawn: (1) Steel jacks are more effective in arresting bank erosion than piling and fencing. Jacks were installed for about $3.40 per lin ft, whereas piling and fence are much more costly. (2) Minimum radius for jack alinement should be about 50 ft. (3) The rate at which a line of jacks can develop efficient sediment deposit to form a new stabilized bank line depends primarily on the trapped debris, sediment carried by the stream, and reduction in stream velocity behind the jacks. (4) The best position for individual jacks is such that one axis of the jack is on a plane 10 to 50 deg downstream from a line normal to streamflow. (5) Bank stabilization can be expedited by sloping the bank behind the jacks, allowing vegetation to get an early start; also, sediment deposit can be accelerated by placing trees and brush between the jacks and bank. (6) Use of retard lines should be limited to locations where a wide area of sediment deposit is desired. (7) Generally, jacks should be placed close to the existing bank in areas of clear water. (8) Placing double rows of parallel jacks is normally of little advantage.

R202430X67A

Frogge, Richard R
STABILIZATION OF FRENCHMAN RIVER USING STEEL JACKS
ASCE Proc, Jour Wtrwys & Hbrs, Vol 93, No WW3, Paper 5396, pp 89-108, Aug 1967. Bureau of Reclamation, McCook, Nebr, 20 p, 25 fig
DESCRIPTORS-- *jacks /structural shape// *bank protection/ river training/ *channel improvements/ stream erosion/ hydraulics/ *stream stabilization/ field tests/ piles/ sedimentation// reaches /distance// jetties/ river regulation/ flood protection/ flood control/ erosion/ *erosion control/ soil erosion
IDENTIFIERS-- Frenchman River, Nebr/ Nebraska/ fences

HYDROLOGY

R202438X67A TURBIDITY IN TRINITY RIVER AFTER STORMS

A study was made to determine the magnitude and duration of turbidity following heavy storms on the Trinity River Division of the USBR's Central Valley Project. The degree of treatment necessary to provide satisfactory domestic water from the impounded river water was investigated also. Findings were: (1) Storms with precipitation of 2 to 4 in. per day caused turbidity increases up to 35 ppm at some of the impoundment sampling stations. Turbidity decreased to less than 5 ppm within several weeks after the storm. (2) The December 1964 storm with precipitation of 5 to more than 10 in. per day caused marked turbidity increases as great as several hundred ppm in the Trinity Division waters. Storm-caused turbidity persisted from 5 to 11 mo at the sampling stations before dropping to the 5 ppm level. (3) Turbid water inflows to the 250,000-acre-ft Whiskeytown Reservoir reached the reservoir outlets within 4 to 5 days. Some sedimentation had occurred in the impoundment in the reservoir since the outflow turbidities were less than the inflow turbidities. (4) Provision of multiple outlets in the dams to permit withdrawal of water from more than one elevation will provide clearer water for domestic and recreational use downstream.

R202438X67A

Heinzel, Lloyd R
STORM EFFECTS ON TURBIDITY IN TRINITY PROJECT WATERS
Jour AWWA, Vol 59, No 7, pp 835-842, July 1967. California State Dept of Public Health, Redding, 8 p, 5 fig, 2 tab, 4 ref
DESCRIPTORS-- *turbidity/ *storms/ reservoirs/ *water quality/ hydraulics/ rainfall/ water sampling/ water analysis/ stratification/ density currents/ turbidimeters/ *suspended sediments/ clay minerals/ sediments/ silts/ water treatment/ flood
IDENTIFIERS-- *Trinity River Division, CVP/ multilevel outlets/ selective level releases/ Whiskeytown Dam, Calif/ thermal stratification/ Trinity Dam, Calif

IRRIGATION

R202482 67A AUTOMATION OF SURFACE IRRIGATION

Recently improved surface irrigation methods and equipment using mechanized automated control structures enable farmers to apply water with minimum labor and obtain maximum benefits. A review is given of the recent developments in automatic irrigation, including a canvas dam released by an alarm-clock timer; self-propelled traveling siphon; radio-controlled system for border irrigation using a moisture sensing device; pneumatically operated radio-controlled valve to vary discharge from turnout structures; and an automatic furrow cutback flow irrigation system reducing flow as furrows are reached by advancing water. The automatic irrigation program at the Snake River Conservation Research Center at Kimberly, Idaho, is described.

R202482 67A

Humpherys, Allan S
RECENT DEVELOPMENTS IN THE AUTOMATION OF SURFACE IRRIGATION
Rept H-007, ASAE, St Joseph, Mich, 1967. ARS, USDA, Kimberly, Idaho, 18 p, 6 fig, 17 ref
DESCRIPTORS-- *surface irrigation/ *automation/ *automatic/ bibliographies/ *automatic control/ water management/ irrigation/ irrigation systems/ check structures/ efficiencies/ instrumentation/ sprinkler irrigation/ irrigation efficiencies/ gates/ flap valves/ water measurement/ remote control systems/ labor/ costs// drops /structures// valves/ check dams/ portable
IDENTIFIERS-- water use/ recirculating irrig system/ border irrigation// canvas dam /irrigation// O-ring seals/ furrow irrigation/ Snake River Cons Res Ctr

R202434X67A ANNUAL REVIEW OF ADHESIVES

New adhesives are being synthesized and formulated continually to meet the ever increasing demand for materials capable of withstanding extreme environmental conditions. In most cases, the adhesive is a synthetic high polymer. The ability of a resin to perform satisfactorily depends upon the fundamentals of polymer science, such as hydrogen bonding, cohesive energy density, flexibility, molecular organization, crystallization, cross linking, and wetting. High-temperature adhesives, neoprene cements, hot-melt adhesives, development of a 1-package structural adhesive, and substrate treatments to improve bonding are reviewed. Lists 33 references.

R202434X67A

Anderson, C Clement
ADHESIVES
Ind & Engg Chem, Vol 59, No 8, pp 91-96, Aug 1967. Pittsburgh Plate Glass Co, Springdale, Pa, 6 p, 3 fig, 1 photo, 7 tab, 33 ref
DESCRIPTORS-- bibliographies/ adhesion/ *adhesives/ bondings/ *materials/ *plastics/ polymers/ high temperature research/ curing/ heat resistance/ reviews/ surface properties/ substrate/ *epoxies/ hardening/ polyethylenes/ joints/ phenolic plastics/ chemical engineering
IDENTIFIERS-- neoprene/ *bonding agents/ resins

R202435X67A ANNUAL REVIEW OF PROTECTIVE COATINGS

Developments in polymer coatings are reviewed to spot trends and provide background information for those in the coatings profession and workers in related fields desiring an instant updating in this technology. The present advances in coatings technology are characterized by: (1) additions to the existing families of polymers by synthesis and evolutionary modifications and (2) the formulation of coatings by application of physics and physical chemistry techniques. Developments in synthetic resins are reported for polyesters, water-based coating resins, thermosetting acrylics, fusion coatings, high-build coatings, silicate coatings, new polymers, and electron curing. Traditional coating formulation practices based on random selection of raw materials, followed by testing in use, are becoming more sophisticated through the use of computers for calculating various resin permutations. This review also includes progress in pigment and dispersion investigations, corrosion protection, performance and weathering tests, and analytical techniques. Has 172 references.

R202435X67A

Gerhart, Howard L and Parker, Earl E
PROTECTIVE COATINGS
Ind & Engg Chem, Vol 59, No 8, pp 42-56, Aug 1967. Pittsburgh Plate Glass Co, Springdale, Pa, 15 p, 3 fig, 4 photo, 2 tab, 172 ref
DESCRIPTORS-- *protective coatings/ *paints/ *polymers/ bibliographies/ *plastics/ coatings/ reviews/ chemical engineering/ metal coatings/ curing/ corrosion control/ weathering/ mechanical properties/ durability/ pigments/ dispersion/ performance tests/ chemical analysis/ materials/ *building materials
IDENTIFIERS-- accelerated testing/ product evaluation/ phenolic coatings/ thermosetting resins

R202436X67A ANNUAL REVIEW OF ELASTOMERS

A general review of the literature appearing in the most widely distributed rubber journals is presented. The review covers developments in production, processing, and commercial applications of rubber; rubber tire technology is stressed, but other applications are mentioned. Applications of computer techniques in compounding new elastomeric materials are discussed briefly. Compounding materials examined include polyisoprenes, polybutadiene, ethylene propylene, polyurethanes, several other elastomers, and polymer blends. Rubber processing, vulcanizing, aging, and physical testing are reviewed. The development of elastomeric compounds for such products as rubber tires, rocket components, threads, and padding for applications under diverse environmental conditions continues to depend upon the development of laboratory tests to cover the appropriate conditions. Has 85 references.

R202436X67A

Alliger, Glen and Weissert, Fred C
ELASTOMERS
Ind & Engg Chem, Vol 59, No 8, pp 80-90, Aug 1967. Firestone Tire & Rubber Co, Akron, Ohio, 11 p, 1 photo, 85 ref
DESCRIPTORS-- *elastomers/ reviews/ bibliographies/ *rubber/ laboratory tests/ test procedures/ production/ tires/ chemical engineering/ organic compounds/ *materials/ materials forming/ computers/ composite materials/ foams/ foam rubber/ molecular structure/ aging/ mechanical properties/ deformation/ elasticity/ environmental tests/ *polymers/ wear resistance
IDENTIFIERS-- vulcanization/ polyurethane resins/ isoprene/ butyl rubber

R202437X67A ANNUAL REVIEW OF PLASTICS TECHNOLOGY

A review of developments in plastics technology, briefly commenting on the impact of plastic products on modern civilization, is presented. Plastic products discussed include containers, composite materials, plastic films, protective coatings, plastic pipe, and foams. Resistance of plastics to weathering, temperature, and fire is examined. Plastics reviewed include phenolic compounds, epoxies, polyolefins, vinyls, styrenes, polyamides, acrylates, and polyurethanes. Analytical procedures are mentioned briefly. Lists 429 references.

R202437X67A

Seymour, Raymond B
PLASTICS TECHNOLOGY
Ind & Engg Chem, Vol 59, No 8, pp 62-74, Aug 1967. U of Houston, Tex, 13 p, 3 photo, 429 ref
DESCRIPTORS-- *plastics/ plastic tubing/ containers/ foams/ sheets/ films/ reviews/ protective coatings/ *materials/ building materials/ weathering/ aging/ temperature/ *polymers/ bibliographies/ phenolic plastics/ epoxies/ thermoplastics/ vinyl plastics/ styrenes
IDENTIFIERS-- acrylic resins/ polyamides/ polyurethane resins/ thermosetting plastics

R202470X67A STRESS-CORROSION AND ELECTRICAL FAILURES

MATERIALS ENGINEERING

Stress-corrosion cracking and its significance in the field of electrical engineering are discussed. This cracking is a phenomenon resulting in the brittle failure of normally ductile alloys when exposed to the combined action of tensile stress and corrosion. The rate of cracking is low by brittle fracture standards but very high for penetration by corrosion alone. Certain alloys are especially prone to this type of failure, and chemical conditions are specific for each case. Failure can be caused by residual and applied low-tensile stress producing no permanent change in the metal in the absence of corrosion and by mild environments producing little corrosion in the absence of stress. A spectrum of mechanisms is apparent in which the relative roles of stress and corrosion are gradually reversed as the spectrum is traversed. This wide range of failure mechanisms indicates that behavior of susceptible alloys must be evaluated in each particular environment and stress field. Specific examples of stress-corrosion cracking and its effect on electrical equipment are given.

R202470X67A

Riley, C C and Winkle, R V
STRESS-CORROSION CRACKING: ITS SIGNIFICANCE IN THE ELECTRICAL ENGINEERING INDUSTRY. English Elec Jour, Vol 22, No 3, pp 18-25, May-June 1967. Nelson Res Labs, Stafford, G B, 8 p, 11 fig, 1 tab
DESCRIPTORS-- *stress/ *corrosion/ cracking/ *brittle failures/ metallurgy/ environment/ alloys/ *electrical equipment/ stress relieving/ chemical properties/ cathodic protection/ heat treatment/ mechanical engineering/ materials failures// fatigue /mechanics// laboratory tests/ contamination/ electrical industries// failure /mechanics/
IDENTIFIERS-- electric machinery/ austenitic stainless steel/ *materials engineering/ foreign research/ Great Britain

R202442X67A AN INTRODUCTION TO DECISION TABLES

MATHEMATICS

Decision tables were developed and organized to analyze, program, and document (1) tabular representations of relationships between variables and parameters and (2) sets of conditions and related sequences of actions which make up sets of rules. A description of different table formats, an explanation of basic fundamentals, and related terminology of decision tables are reviewed. Instructions for preparing decision tables, suggestions for organizing the data within the table for analysis, and rules for interpreting the meaning of the data relationships are discussed. Several examples of decision tables are included to assist the reader in developing tables for other applications. The use of decision tables for analyzing data and structuring their relationships simplifies the computer programming task and reduces the storage requirements for processing. A usage guide for determining types of data-handling tasks which can be analyzed most efficiently with decision tables is presented. The author summarizes the advantages of using decision tables for analyzing, programming, and documenting computer-based systems. Has 27 references.

R202442X67A

Chapin, Ned
AN INTRODUCTION TO DECISION TABLES
DPMA Quarterly, Vol 3, No 3, pp 2-23, Apr 1967. 21 p, 15 fig, 27 ref
DESCRIPTORS-- *logic/ *documentation/ *computer programming/ *systems analysis/ data reduction/ correlation techniques/ *decision making/ data processing systems/ methodology/ digital computers/ collecting method/ matrix algebra/ flow diagrams/ algorithm/ operations research/ mathematical analysis/ bibliographies
IDENTIFIERS-- *decision tables/ data elements/ COBOL/ FORTRAN

R202413 67A PERIODIC SURGES IN FRANCIS TURBINES

The new high-head Francis turbines designed for use at Bratsk and Krasnoiarsk Powerplants necessitated a thorough investigation of the dynamic flow processes in such turbines. These studies were conducted in laboratories and operating powerplants by Soviet research organizations. Test equipment and procedures are described and results given on the study of low-frequency periodic pressure surges in spiral cases and draft tubes. Two basic types of periodic surges can be distinguished--rotational and vortical. The first type has a frequency near that of rotation, appears in the spiral case but not in the draft tube, and causes so much vibration of the turbine head cover and support bracket that the unit cannot be operated. This surge is associated with water filling the gap between the head cover and the runner after a break in flow and being discharged at different rates by relief valves to the draft tube. Significant resonance occurs at a specific relative penstock length, for which a formula is given. Vortical surges, starting in the draft tube, and at partial loads often transmitted by the pier to the spiral case and penstock, cause a circulation in the discharge leading to negative pressures at the diffuser and overpressures at the periphery. At partial loads there is a significant sinusoidal pulsation.

R202413 67A

Shramkov, K A
PERIODIC PRESSURE SURGES IN FRANCIS HYDRAULIC TURBINES
Gidrotek Stroitel'stvo, No 7, pp 34-37, 1965. Transl from Russ, USBR Transl 629, Feb 1967, 14 p, 5 fig, 4 ref
DESCRIPTORS-- *Francis turbines/ vibrations/ *draft tubes/ turbine parts/ *surges/ penstocks/ turbine blades/ turbine runners/ field tests/ velocity/ laboratory tests/ natural frequency/ periodic variations/ laboratory equipment/ spiral cases/ operations/ pressures/ operation and maintenance/ pressure pipes/ Kaplan turbines/ flow/ negative pressures/ water hammer/ resonance/ hydraulic turbines/ vortices
IDENTIFIERS-- USSR/ foreign research

R202462 67A STRESS ANALYSIS OF HYDRAULIC MACHINERY

The finite element technique of stress analysis is a method whereby complex 2-dimensional or axisymmetric structures are mathematically represented by a finite number of separate elements interconnected at a finite number of nodal points. Stress analysis of complex hydraulic machinery by advanced computerized analytical methods is described. The theory of the finite element method and computer programs used in the analysis are discussed. This method of stress analysis is illustrated by analyzing stresses in pump turbine head covers of the Oroville Powerplant and stresses in the turbine stay ring of the Thermalito Powerplant. Present experience with the finite element technique indicates that it provides a highly accurate representation of the stresses and deflections and gives the engineer a superior insight into the structural behavior of complex hydraulic machinery.

R202462 67A

Paul, K, Jr
STRESS ANALYSIS OF OROVILLE POWERPLANT PUMP-TURBINE HEAD COVERS AND THERMALITO POWERPLANT TURBINE STAY RINGS BY FINITE ELEMENT TECHNIQUES.
Tech Memo 25, California Dept of Water Resrcs, Sacramento, July 1967. 28 p, 17 fig, 5 ref
DESCRIPTORS-- *stress analysis/ *hydraulic machinery/ *pump turbines/ *stay rings/ hydroelectric powerplants/ turbine parts/ computer programming/ pressures/ temperature/ *deflection/ hydrostatic pressures/ elasticity modulus/ tangential stress/ *hydraulic turbines
IDENTIFIERS-- *finite element method/ Oroville Powerplant, Calif/ *turbine head covers/ Thermalito Powerplt, Calif/ evaluation

R202466 67A FRAZIL ICE CRYSTALS IN TURBULENT FLOWS **PHYSICS**

Information on the crystallization of supercooled water is needed for solving a number of problems related to winter operation of power stations. Studies conducted at Moscow State University on formation and growth of frazil ice crystals in moving flow are reported. Experimental results are presented on size distribution functions of frazil ice crystals formed and grown in turbulent flow. An analytical expression for size distribution is obtained from the experimental data. The coefficient determining the location of the maximum point on the crystal size distribution curve depends on the time that passes after the moment of maximum supercooling of the water: the shorter the time, the larger the coefficient. The shape of the crystal size distribution curve indicates that crystal origination is of a cascading nature during the initial nucleation and growth period when there is adequate supercooling.

R202466 67A

Bukina, L A
SIZE DISTRIBUTION OF FRAZIL ICE CRYSTALS IN TURBULENT FLOWS
Atmos & Oceanic Phys, Vol 3, No 1, pp 31-36, Jan 1967. Izv, Acad of Sci, USSR, 6 p, 6 fig, 2 tab, 11 ref
DESCRIPTORS-- *ice/ crystal growth/ crystallization/ turbulent flow/ cold weather operations/ *frazil ice/ *hydroelectric powerplants/ crystals/ sizes/ particle size/ *nucleation/ mixing/ freezing/ water/ physics
IDENTIFIERS-- supercooling/ *size frequency distribution/ ice nuclei/ ice crystals/ foreign research/ USSR/ ice forming/ *ice-crystal process

R202409 67A FRICTION IN GRANITE **ROCK MECHANICS**

Although friction in rocks is theoretically important in the Coulomb criterion of rock fracture, modified Griffith theory of fracture, attenuation of seismic waves, and determination of Young's modulus and Poisson's ratio, the physical processes involved in the frictional sliding of brittle rocks are not clear. Physical processes in frictional sliding and effects of surface roughness and confining pressure on the coefficient of friction are reported. Changes in friction with displacement, load dependence of friction, and effects of water are discussed. At high confining pressures, friction between ground surfaces of granite reaches a maximum value after 0.1 cm displacement and then decreases to a nearly constant value after sliding 0.5 cm. This maximum value is nearly the same as the initial value for perfectly mated rough surfaces. Decrease in friction is probably caused by rolling on wear particles. Under increasing confining pressures, friction decreases with increases in normal stress. Sliding movements occur with violent stick-slip and appear to be controlled by brittle fracture. Test results on granite are not in agreement with the Coulomb theory of rock fracture but are consistent with the effective stress theory as applied to friction. Has 32 references.

R202409 67A

Byerlee, James D
FRICTIONAL CHARACTERISTICS OF GRANITE UNDER HIGH CONFINING PRESSURE
Jour of Geophys Res, Vol 72, No 14, pp 3639-3648, July 15, 1967. USGS, Silver Spring, Md, 10 p, 13 fig, 32 ref
DESCRIPTORS-- bibliographies/ strength of materials/ *rock mechanics/ *brittle failures/ friction/ *friction tests/ sliding/ *granites/ surfaces/ confinement/ triaxial loads/ fractures/ normal stress/ displacements/ effective stress// failure /mechanics// earthquakes
IDENTIFIERS-- Coulomb failure theory/ rock properties/ confining pressure// *friction coefficient /mech/

R202414 67A VIBRATING WIRE INSTRUMENTS

Vibrating wire methods are new and relatively untried in Canada and the U S but have been developed to a high degree, especially by the British Building Research Station. Vibrating wire gages are basically mechanical instruments; therefore, they have an advantage over strictly electrical strain gages in that any changes in the properties of the electrical circuit do not alter the gage or its frequency. These instruments are particularly useful in fieldwork where electrical circuits are prone to damage and deterioration. Basic operating principles are given, and literature concerning the development of the instruments is covered briefly but comprehensively. Twenty Maihak vibrating wire piezometers and 10 Maihak vibrating wire earth pressure cells were installed in Wildwood Dam, a rolled earthfill dam in Ontario, Can. Laboratory and field tests, installation, and evaluation of the instruments and conductor cables are described. The instruments appear quite stable and suitable for their purpose; however, the piezometers encounter the same difficulties as any other type of piezometer in partially saturated soil when the pore water pressure approaches absolute zero. Has 66 references.

R202414 67A

Scott, J D and Kilgour, J
EXPERIENCE WITH SOME VIBRATING WIRE INSTRUMENTS
Can Geotech Jour, Vol 4, No 1, pp 100-123, Feb 1967. U of Ottawa, Canada; Assoc Geotech Serv Ltd, Toronto, Canada, 24 p, 10 fig, 1 tab, 66 ref, disc
DESCRIPTORS-- bibliographies/ vibrations/ gages/ *piezometers/ field investigations/ earth dams/ *earth pressures/ measuring instruments/ pore pressures/ frequency/ *strain gages/ pressure gages/ pressure sensors/ pore air pressures/ soil tests/ foreign design practices/ pore water pressures/ soil mechanics/ instrumentation
IDENTIFIERS-- *pressure cells/ in situ tests/ *vibrating-wire strain gage/ Wildwood Dam, Canada/ Canada/ foreign products/ product evaluation

R202418X67A LIME-SOIL MIXTURE ENGINEERING PROPERTIES

When lime-reactive soils are stabilized with quality lime, the cured lime-soil mixtures display substantial compressive, shear, and tensile strengths and the stress-strain properties are altered (higher modulus of elasticity, lower failure strains) in comparison to the natural soil. Many of these materials can be used successfully as bases or subbases for typical highway pavements, assuming that durability is adequate. Results of the studies reported in this paper indicate the general range of strength (compressive, shear, tensile, CBR) for typical Midwestern U S soils stabilized with lime; data pertaining to flexural fatigue and stress-strain properties also are presented. Since properties of a lime-soil mixture change with further curing (due to the development of additional cementing products), conducting elaborate field tests to precisely evaluate properties that will change due to field curing effects may not be justified. Use of unconfined compressive strength for evaluating quality of the mixture and estimation of other pertinent mixture properties using correlations similar to those developed in this study are suggested. Has 15 references.

R202418X67A

Thompson, M R
ENGINEERING PROPERTIES OF LIME-SOIL MIXTURES
Preprint, ASTM Paper 78, 70th Ann Mtg, Boston, Mass, June 1967. U of Illinois, Urbana, 31 p, 10 fig, 3 tab, 15 ref
DESCRIPTORS-- *lime soil mixtures/ *soil physical properties/ pavements/ subbase/ subgrade/ *soil investigations/ elasticity modulus/ lime/ *soil stabilization/ stress-strain curves/ Poisson ratio/ shear strength/ compressive strength/ splitting tensile strength/ unconfined compression/ finegrained soils/ test procedures/ California bearing ratio// fatigue /mechanics// soil mechanics/ bibliographies/ highways
IDENTIFIERS-- Illinois

R202422 67A FIELD VANE SHEAR TESTS AT WILLARD DAM

Willard Dam comprises an embankment of over 16 million cu yd constructed on a very soft foundation of 130 ft of predominately lacustrine soils. The embankment was raised in 3 stages to 35 ft above original ground surface, permitting strength increase in the foundation between each stage. Strength increase was measured by means of the Bureau of Reclamation field vane test. These tests indicated that the measured strength increased concurrently with consolidation and drainage of the subsurface strata and that the variation of the maximum vane shear strength, vertically and horizontally beneath the embankment, coincided with a computed embankment vertical stress distribution. Strength increases as much as twice the initial values were measured beneath the center of the embankment. Preconstruction investigations and studies during construction are discussed, foundation conditions are described, and field vane test procedures and results are presented.

R202422 67A

Esmiol, Elbert E
THE FIELD VANE TEST--A CONSTRUCTION CONTROL DEVICE
Paper, 3rd Pan-Amer Conf on Soil Mech & Fdn Engg, Caracas, Venezuela, July 1967. Bureau of Reclamation, Denver, Colo, 28 p, 12 fig, 8 ref
DESCRIPTORS-- clays/ cohesion/ consolidation/ *dam design/ plasticity index/ soil mechanics/ neutral stress/ pore pressures/ shear strength/ stability analysis/ embankments/ lacustrine deposits/ relative consistency/ *earth dams/ *dam foundations/ foundation investigations/ moisture content/ organic soils/ safety factors/ *vane shear tests/ field control
IDENTIFIERS-- Willard Dam, Utah/ Utah/ stage construction/ construction control

R202423 66A SEEPAGE FROM CLAY-LINED PONDS

A simple method for analyzing seepage from clay-lined ponds is presented. The analysis is based upon steady-state seepage occurring after equilibrium is attained between the pond's water level and the water table. With equal flow rates through the lining and subsoil, Darcy's law is applied to analyze the effects of pond depth and permeability and thickness of the lining and subsoil. Seepage is also affected by the depth of the water table and the pore water pressure profile. For unlined ponds, the pore pressure is positive down to the water table; for relatively impervious linings, the pore pressure changes from positive to negative. With access to air, negative pore pressures cause desaturation of pervious material with a consequent decrease in permeability. The study concludes that if aeration of the subsoil is possible, a low water table is advantageous; if aeration is not possible, seepage may be reduced by raising the water table. To effectively control seepage, the lining permeability should be less than 1% of the subsoil permeability. A thin layer of highly impervious material is more effective than a greater thickness of more pervious material.

R202423 66A

Blight, G E
SEEPAGE FROM CLAY-LINED PONDS
The Civil Engr in S Africa, Vol 8, No 7, pp 215-221, July 1966. CSIR, Pretoria, S Africa, 7 p, 11 fig, 7 ref
DESCRIPTORS-- *ponds/ *seepage/ *seepage losses/ reservoirs/ clays/ *earth linings/ sands/ pore water pressures/ negative pore pressures/ pervious soils/ impervious linings/ foreign design practices/ permeability/ ground water/ water table/ subsoil/ pore pressures/ saturation/ *lower cost canal linings
IDENTIFIERS-- Darcys law/ South Africa

R202458X67A ELECTROKINETICS APPLICATIONS IN GROUTING

Electrokinetic phenomena are associated with the application of an electrical field to soil; usually direct current is utilized. The electric field causes water to flow through the pores of soils of low permeability and, for a variety of reasons, hardens the soil. While the electric field is being applied, permeability of the soil is increased by a factor of 2 or more, thereby reducing the time required to introduce a grout when pumping at a specified pressure. The electric field also acts to pump grout into the soil or causes the development of negative pore pressures near a grout pipe, thus effectively increasing the grouting pressures without increasing the danger of surface heave. A summary is presented of some recently reported successful applications of electrokinetics in grouting in Rumania, Israel, the United States, and Great Britain. Several possible limitations of the method are suggested and an indication of the cost of power is presented. Has 21 references.

R202458X67A

Esrig, Melvin I
APPLICATIONS OF ELECTROKINETICS IN GROUTING
Conf Preprint 480, ASCE Struc Engg Conf, Seattle, Wash, May 1967. Cornell U, Ithaca, N Y, 31 p, 7 fig, 21 ref
DESCRIPTORS-- *electrokinetics/ *grouting/ bibliographies/ soils/ direct currents/ permeability/ electric fields/ negative pore pressures/ heaving/ hydraulic gradients/ flow/ sodium chlorides/ *soil stabilization/ costs/ chemicals/ bentonites/ soil mechanics/ chemical grouts/ electrodes
IDENTIFIERS-- sodium silicate

R202463 67A SOIL COMPACTION FIELD STUDY

Full-scale field tests dealing with soil compaction for highway construction were undertaken to determine: (1) desired characteristics of compacted soil, (2) how best to measure and specify proper compaction, and (3) effectiveness of various methods of achieving compaction. Test variables included: type of soil or base course material, moisture content, lift thickness, type of compaction equipment, compactive effort, and number of roller coverages. Measurements of soil properties were made using a cone penetrometer, 6-in. bearing plate, California bearing ratio apparatus, seismograph, portable nuclear moisture-density instrument, nuclear road logger and sand cone, together with conventional moisture content procedures. Experiments were divided into 6 sets, 3 for subgrade soils and 3 for base course materials, each incorporating some of the independent variables for different purposes. Statistical techniques were used for planning experiments and analyzing data. Scope of field tests, plans, procedures, and type of information being obtained are described.

R202463 67A

Hampton, Delon and Selig, E T
FIELD STUDY OF SOIL COMPACTION
Hwy Res Record, No 177, pp 44-57, 1967. Illinois Inst of Technol, Chicago, 14 p, 7 fig, 6 tab, 5 ref
DESCRIPTORS-- *compaction/ *soil compaction/ highways/ *compaction tests/ soils/ *field tests/ *compaction equipment/ moisture content/ base courses/ subgrade/ rollers// vibrators /mechanical// prototype tests/ penetrometers/ test procedures/ density/ soil physical properties/ soil mechanics/ California bearing ratio
IDENTIFIERS-- nuclear density meters

R202464 67A FIELD COMPACTED SOILS

Properties of field compacted soils and factors influencing soil compaction were investigated by a series of soil compaction tests. Test sections of soil in single lifts were compacted on a prepared foundation using a variety of commercial rollers. The main parameters varied were soil type, moisture content, lift thickness, compaction equipment, and compactive effort. The test plan was based upon a statistical model, permitting separation of real effects from random variability. Soil strength, stiffness, and density measurements were made using a variety of techniques. The effects of the selected variables on the measured soil properties were detected by conducting a full factorial experiment consisting of 256 test sections and by using analysis of variance techniques. Effect of the test variables on CBR, penetration resistance, bearing stiffness, seismic velocity, and density are discussed, and field and standard laboratory measurements of density and CBR are compared.

R202464 67A

Selig, E T and Truesdale, W B
PROPERTIES OF FIELD COMPACTED SOILS
Hwy Res Record, No 177, pp 77-97, 1967. Illinois Inst of Technol, Chicago, 21 p, 12 fig, 4 tab, 2 ref
DESCRIPTORS-- *soil compaction/ soil investigations/ *soil mechanics/ soil physical properties/ soil moisture/ field tests/ compaction equipment/ *compaction tests/ statistical analysis/ stiffness/ penetration tests/ *California bearing ratio/ density/ bearing values/ Proctor curves/ seismic waves/ pneumatic tired rollers// lifts /construction// tamping rollers
IDENTIFIERS-- nuclear moisture meters/ vibratory compaction/ seismic velocity/ *soil density

R202465 67A EMBANKMENT COMPACTION STATISTICAL STUDY

The distribution of percent relative compaction obtained with current soil compaction control procedures was analyzed statistically. The survey included 3 embankment projects whose soils varied from homogeneous to very heterogeneous materials. Testing operations for each sampling station included 2 in-place density determinations by the sand volume method and 2 maximum density determinations by the California impact method for each sand volume test. Analysis of percent relative compaction results for the 3 projects revealed average values of 92.9, 90.5, and 93.6%, with standard deviations of 2.4, 3.1, and 5.5%, respectively. The greatest dispersion in results was found to exist for the heterogeneous soils. Factors contributing to the dispersion of percent compaction were found to be the variation inherent in the testing procedure, soil, and compaction process. Curves show comparison of field control test results and randomly sampled test results. A partial review of problems expected to be encountered in the development and use of purely statistical specifications is presented. Has 23 references.

R202465 67A

Sherman, George B; Watkins, Robert O; Prysock, Rogel H
A STATISTICAL ANALYSIS OF EMBANKMENT COMPACTION
Hwy Res Record, No 177, pp 157-185, 1967. California Div of Hwys, Sacramento, 29 p, 33 fig, 8 tab, 23 ref, append
DESCRIPTORS-- *embankments/ *compaction/ *soil compaction/ specifications/ *statistical analysis/ test procedures/ soils/ highways/ bibliographies/ density/ field tests/ statistics/ heterogeneity/ homogeneity/ apparatus/ soil mechanics/ compaction tests
IDENTIFIERS-- nuclear density meters/ random sampling

R202431 67A DESIGN OF PRESTRESSED MULTIBEAM BRIDGES

An analysis is presented of prestressed multibeam bridges consisting of similar precast beam units placed side by side and connected by shear keys. The beam units are assumed to be connected by a finite number of hinges. A FORTRAN IV computer program was developed to determine shears transferred at the hinges, live load moments and deflections, and dead load moments and deflections. A prototype bridge and laboratory model bridge with measured deflections were analyzed and comparisons of the measurements and theoretical deflections are presented. Sample input and output data sheets are included and the source program listing is given.

R202431 67A

Nelson, Duane F and Burton, Leroy H
DESIGN OF PRESTRESSED MULTIBEAM BRIDGES
USBR Rept CB-4, Canals Br, June 1967. Bureau of Reclamation, Denver, Colo, 29 p, 6 fig, 3 tab, 4 ref, append
DESCRIPTORS-- beams/ *bridge design/ concrete structures/ deflection/ live loads/ longitudinal joints/ moment distribution/ shear forces/ computer programming/ precast concrete/ laboratory tests/ field tests/ bending moments/ cellular structures/ dead loads/ hinged structures/ load distribution/ *structural analysis/ torsion/ bridges/ prestressed concrete/ stress analysis/ keyways
IDENTIFIERS-- *multibeam bridges/ FORTRAN/ shear keys

R202433X67A TRANSMISSION TOWER DESIGN GUIDE

An ASCE task committee has developed specific loading recommendations for self-supporting steel transmission towers. The development of workable and tested compression formulas for angles based on the yield point of steel is given considerable attention. Compression formulas illustrated by curves are developed for 36,000- and 50,000-psi yield steels. Examples showing slenderness ratio determination and allowable compressive stress for angles based on yield point are included. Angle width-to-thickness ratio is acknowledged in the development of the formulas, and effects of end connections are recognized in determining the slenderness ratio. Design formulas for compression members, fabrication and testing recommendations, foundation nomenclatures, survey information, and construction methods also are included in the report; requirements for the electrical components of a transmission line (fully covered in the National Electrical Safety Code) are not included.

R202433X67A

ASCE Task Committee on Tower Design
ELECTRICAL TRANSMISSION LINE AND TOWER DESIGN GUIDE
ASCE Proc, Jour Struc, Vol 93, No ST4, Paper 5403, pp 245-282, Aug 1967. 38 p, 14 fig, 4 tab, 7 ref
DESCRIPTORS-- structural analysis/ transmission lines/ *transmission towers/ *design criteria/ design tools/ *structural design/ steel structures/ foundations/ construction/ specifications/ standards/ building codes/ *load factors/ wind pressures/ ice loads/ overloads/ yield point/ structural shapes/ fabrication/ erection/ prototype tests/ bracings/ mechanical fasteners/ surveying/ *compression members/ towers
IDENTIFIERS-- slenderness ratio/ construction methods

R202459X67A STRUCTURAL MODEL--FABRICATION AND TESTING

Important techniques in structural modeling are reviewed and some of the limitations imposed by presently available methods are discussed. When considering the use of structural models, the importance of fabrication, loading, and instrumentation techniques should be given careful attention. Final accuracy, costs, and time requirements depend largely on fabrication, loading, and data acquisition and interpretation procedures; thus, continued development of improved modeling techniques aims at reproducing and documenting behavior of the prototype more accurately, economically, or rapidly. While these are not mutually exclusive, the generally more demanding materials, fabrication, and loading requirements for realistic inelastic model testing have tended to increase the overall cost and time requirements. These trends tend to restrict application of inelastic models to broader research and development investigations or design of specific important structures. Techniques used with elastic models in studies of service load stresses or strains and elastic buckling investigations, as well as techniques for inelastic models required in ultimate strength or collapse load studies, are discussed. Primary attention, however, is given to inelastic model studies because of recent developments of inelastic and limit state analyses. Has 36 references.

R202459X67A

Breen, John E
STRUCTURAL MODELS--FABRICATION AND TEST TECHNIQUES
Conf Preprint 472, ASCE Struc Engg Conf, Seattle, Wash, May 1967. U of Texas, Austin, 29 p, 1 fig, 36 ref
DESCRIPTORS-- *structural models/ *model tests/ *models/ *fabrication/ plastics/ concrete structures/ reinforced concrete/ loads/ static tests/ instrumentation/ deformation/ costs/ scale/ bibliographies/ structural behavior/ test procedures
IDENTIFIERS-- *elastic models/ dynamic tests

R202461X67A STRUCTURAL MODELS--MATERIALS

A suitable material for structural models, in addition to satisfying the laws of similitude, should be easily available, easily fabricated, and relatively inexpensive and must possess reproducible mechanical properties and geometric stability. The most commonly used model materials are plastics, cementitious materials (unreinforced and reinforced), and metal. If indirect models are to be constructed, any material exhibiting a linear stress-strain relation is adequate; thus, plastics, because of their low modulus of elasticity, are used frequently. If direct models are to be used, the only requirements are linearity of the stress-strain curves of the model and prototype materials with a constant scale factor and equality of Poisson's ratio. When models are to be used to determine the elastic and ultimate strength characteristics of the prototype, all points on the stress-strain curves of the model and prototype materials must be homologous up to the failure stress and strain and Poisson's ratio of both materials must be equal. Materials in common use in the construction of models are described, and advantages, disadvantages, and limitations are discussed. Has 36 references.

R202461X67A

Roll, Frederic
STRUCTURAL MODELS--MATERIAL
Conf Preprint 470, ASCE Struc Engg Conf, Seattle, Wash, May 1967. U of Pennsylvania, Philadelphia, 65 p, 5 fig, 4 tab, 36 ref
DESCRIPTORS-- *structural models/ *models/ *materials/ plastics/ cement/ stress-strain curves/ mortars/ elasticity modulus/ Poisson ratio/ portland cement/ gypsums/ plasters/ diatomites/ reinforced concrete/ bibliographies/ reinforcing/ concrete/ metals/ structural behavior
IDENTIFIERS-- bond strength/ similitude

STRUCTURAL AND ARCHITECTURAL ENGINEERING

R202467X67A ELECTRIC TRANSMISSION TOWER DESIGN

The design of electric transmission towers is a specialized branch of civil engineering. Procedures and practices peculiar to the design of high-voltage electric transmission towers are presented, and considerations involved in establishing tower configuration and dimensions are set forth. Relative merits of various bracing systems for the tower pedestal are discussed. The author describes the derivation of transverse, vertical, longitudinal, and dead loads for which a tower must be designed, together with their relative effects on overall tower weight. A formula for estimating the dead weight of transmission towers is given, and a stress analysis and summary of a typical 500-kv tower are presented to illustrate the traditional method of tower design. Selection of tower members is discussed. A column curve, in use by the author and substantiated by a number of tower tests, is included. Established tower fabricators now are equipped to test full-size transmission towers. Observation of such a test is a valuable experience for design engineers.

R202467X67A

Marjerrison, Matthew
ELECTRIC TRANSMISSION TOWER DESIGN
Conf Preprint 466, ASCE Struc Engg Conf, Seattle, Wash, May 1967. BPA Portland, Oreg, 52 p, 13 fig, 1 tab, 6 ref
DESCRIPTORS-- *transmission towers/ steel structures/ stress analysis/ test procedures/ strength of materials/ *structural design/ high strength steel/ economics/ clearances/ *extra high voltage/ maintenance/ ice loads/ wind pressures/ vertical loads/ horizontal loads/ dead loads/ transmission lines/ footings/ electric insulation/ electric cables
IDENTIFIERS-- National Elec Safety Code/ electric conductors/ galloping conductors/ grillage footings/ belled footings/ electrical insulators

WATER RESOURCES

R202439X67A WATER QUALITY CHANGES FROM IMPOUNDMENT

A study of streamflow, turbidity, and coliform organism data from the Iowa River at Iowa City was made over a 15-yr period to determine how impoundment changes water quality and whether present bacteriologic criteria are realistic. The Coralville Flood Control Dam, located about 6 mi above Iowa City, was completed in Sept 1958, making possible a before-and-after water quality data comparison. In addition to functioning as a flood control project, the Coralville impoundment was found to have influenced the downstream water quality of the Iowa River. Turbidity was reduced greatly; coliform density was reduced somewhat, becoming more uniform but remaining generally poor. The bacterial quality of the water exceeded the U S Public Health Service Group IV standard more than half the time. Seasonal differences in water quality remained; however, the impoundment tended to reduce the variation, for example, by distributing poor water from spring runoff over a longer period of time. Streamflow, turbidity, and bacterial density followed the same seasonal pattern. Increases in flow were accompanied by increases in turbidity and bacterial density. During high flows, the extremely high coliform densities were attributed to agricultural land drainage.

R202439X67A

Powell, Marcus P and Berthouex, P M
WATER QUALITY CHANGES DUE TO IMPOUNDMENT
Jour AWWA, Vol 59, No 7, pp 829-834, July 1967. U of Iowa, Iowa City; U of Connecticut, Storrs, 6 p, 3 fig, 1 tab, 3 ref
DESCRIPTORS-- *water quality/ *reservoirs/ *turbidity/ water storage/ water analysis/ *bacteria/ filtration/ water treatment/ water sampling/ sewage effluents/ streamflow/ water pollution/ sewage treatment/ standards
IDENTIFIERS-- *impoundments/ *reservoir storage/ *coliforms/ Iowa River, Iowa/ Iowa

R202454 67A INSTRUMENTATION EVALUATES WATER QUALITY

Automatic instruments are valuable and necessary tools for the collection and analysis of water quality data. Formerly, water quality sampling programs consisted chiefly of collecting spot samples at selected sites in an area of study. Such samples, taken on a monthly, weekly, or even a daily basis, show general long-term trends in water quality but fail to show short-term fluctuations. Diurnal variations in quality can be caused by biological activity and sunlight and air temperature variations. Other cyclic fluctuations can be caused by changing weather conditions, sporadic discharge of sewage and industrial effluent, and tide stage in areas subject to tidal influence. This paper describes several automatic monitoring instruments and discusses their use in the water quality management program of the Bureau of Reclamation in Region 2.

R202454 67A

Roche, W Martin
THE ROLE OF AUTOMATIC INSTRUMENTATION IN WATER QUALITY MANAGEMENT
Paper, 13th Natl ISA Analysis Instrumentation Symp, Los Angeles, Calif, May-June 1967. Bureau of Reclamation, Sacramento, Calif, 6 p, 1 fig
DESCRIPTORS-- *water quality/ instrumentation/ automatic/ water analysis/ salinity/ salinity meters/ saline water/ temperature/ recording systems/ *data collection systems/ mobile equipment/ water pollution/ turbidity/ pH/ *water sampling/ dissolved oxygen/ chemical analysis/ water stage recorders/ electrical conductance
IDENTIFIERS-- *water quality monitors/ *water quality control/ dissolved solids/ water temperature/ Central Valley Proj, Calif

R202468 67A POTABILITY AND STREAM QUALITY STANDARDS

As a result of public concern regarding water and air pollution, massive programs are now being conceived and implemented for pollution abatement. The danger of pollution control agencies imposing unbearable and economically wasteful restrictions on U S water resources is examined. Treatment of municipal water at the water treatment plant is assumed to be more economical than building sewage plants to improve the raw water. Pollution abatement is secondary to water treatment insofar as a safe water supply for a community is concerned. Official criteria for raw water quality are unnecessary and may even hinder the efficient development of the total resource potential of an area. An individual river basin approach policy is recommended for water resources development.

R202468 67A

Culver, Robert H
INFLUENCE OF STREAM QUALITY STANDARDS ON POTABLE QUALITY
Paper, AWWA Ann Conf, Atlantic City, N J, June 1967. Camp, Dresser & McKee, Boston, Mass, 11 p
DESCRIPTORS-- water development/ river basin development/ municipal water/ water laws/ water management/ *water pollution/ water requirements/ *water quality/ pollution abatement/ sewage treatment/ policy matters/ economics/ *standards/ water resources/ water reuse/ water supplies/ water treatment/ *stream pollution/ water demand
IDENTIFIERS-- *potable water/ waste water treatment/ *effect/ water pollution control

R202469 67A LAKE DESTRATIFICATION BY PUMPING

Artificial destratification of lakes and reservoirs has proved to be effective in upgrading water quality that has deteriorated because of thermal stratification. The experiments reported had a 2-fold purpose: (1) to compare mechanical- and diffused-air-pumping methods for artificially destratifying impoundments, and (2) to determine whether 1 mixing in the late summer or a series of mixings periodically throughout the season was the better method for maintaining good water quality. During 1965, a study lake was destratified by mechanically pumping water from the bottom and discharging it on the surface for 5 weeks in Aug and Sept. In 1966 a diffused-air-pumping system was used for mixing a study lake 4 times periodically throughout the season; a second study lake was mixed 5 times using the same method. On the basis of oxygenation capacity and destratification efficiency, the diffused-air-pumping system apparently worked better and was easier to install and operate than the mechanical-pumping system. Effects on dissolved oxygen, nitrogen, phosphorus, iron, manganese, sulphides, algal growth, and algae are described. Has 19 references.

R202469 67A

Symons, James M; Irwin, William H; Robinson, Ernest L; Robeck, Gordon G
IMPOUNDMENT DESTRATIFICATION FOR RAW WATER QUALITY CONTROL USING EITHER MECHANICAL- OR DIFFUSED-AIR-PUMPING. Paper, 87th Ann Conf of AWWA, Atlantic City, N J, June 1967. FWPCA, Cincinnati, Ohio, 57 p, 20 fig, 5 tab, 19 ref

DESCRIPTORS-- *aeration/ *reservoirs/ air/ *lakes/ bibliographies/ mixing/ diffusion/ water quality/ *dissolved oxygen/ nitrogen/ algae/ temperature/ mixers/ plankton/ phosphorus/ oxidation/ limnology

IDENTIFIERS-- *destratification /thermal// *reaeration/ *pumping/ *diffused air pumping system/ thermal stratification/ impoundments/ *oxygenation/ nutrients

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LIBRARY OF THE URBANA CHAMPAIGN

R202489X67A WRITING LIKE A PRO

Writing reports, papers, proposals, and manuals can be easier and less distasteful to engineers if they adopt the methods of professional writers. The engineer should think of the writing task as an engineering project, estimating and scheduling the time required for completion; by working on schedule, he will have time for the subconscious to work with the conscious mind as a creative tool. He must coordinate writing with his peak energy period and seek quiet and thought-producing surroundings. The professional uses these methods to get started. Later, if difficulties continue to persist, the following requirements should be reviewed: (1) know the reader and his interests and direct the writing to him, (2) be sure the main subject is not overshadowed by a dozen different and competing topics, and (3) acquire enough background information to support the main subject. The engineer should convey enthusiasm for and knowledge of his subject to the reader. Mechanical writing skills such as spelling, grammar, and punctuation can be left to the typist or editor. Experimenting to find the best method and time for working will produce the precise and efficient tools necessary for communicating effectively.

R202489X67A

Clarke, Emerson
WRITE IT LIKE A PRO
Machine Design, Vol 39, No 20, pp 90-92, Aug 31, 1967. Zenith Radio Corp, Chicago, Ill, 3 p, 2 fig
DESCRIPTORS-- *technical writing/ engineering personnel/ management/ time/ *methodology/ planning/ preparation/ *scheduling/ applied psychology/ work/ concentration/ efficiencies/ creativity/ environment/ orientation/ editing/ communications/ training/ professional personnel
IDENTIFIERS-- ideas/ problem solving/ clarity

R202490X67A SYSTEMS ANALYSIS--AN ORDERLY APPROACH

Business systems analysis is an orderly study of the detailed procedures for collecting, organizing, and evaluating information within an organization, with the objective of improving control over its operations or reducing the cost of exercising this control. Environmental problems such as people, space, business objectives, available data, state of documentation, prejudices, and inbred concepts make analysis extremely difficult for the systems analyst to relate one case to another and directly apply past experience to the particular project at hand. An attempt to allay some of the misconceptions about systems analysis and propose a phased program for orderly and controllable systems review which can be ended, expanded, or contracted at will are discussed. The phased program for systems analysis consists of 3 segments: (1) current systems review--the determination of whether the current system satisfactorily performs the functions expected of it; (2) feasibility study--the study in which a projection is made of how a proposed system might operate in a particular organization to provide the basis for a decision to replace or not replace the existing system; and (3) applications study--the detailed process of designing a system or set of procedures for using data processing equipment for a selected function.

R202490X67A

Mason, John J
BUSINESS SYSTEMS ANALYSIS--AN ORDERLY APPROACH
Computers & Automation, Vol 16, No 8, pp 26-31, Aug 1967. Holland Assoc, Inc, Washington, D C, 6 p, 1 fig
DESCRIPTORS-- *systems analysis/ *methodology/ data processing systems/ management/ project planning/ feasibility studies/ computers/ automation/ capital costs/ scheduling/ coordination/ control/ standards/ documentation/ decision making/ economics/ operations research/ professional personnel/ operations
IDENTIFIERS-- *systems engineering/ procedures/ *management planning/ information systems

ADMINISTRATION AND MANAGEMENT

R202514X67A BIG NEW PUSH TO EDUCATE

In-service educational technology has developed at such a rapid rate and over such a broad spectrum that business and academic communities have not grasped the significance of this very real revolution. This expansion helps the administrator meet the challenge of the shortage of competent people in all types of organizations. He must exert a generalist-manager's knowledge of training, trainers, and learning tools; keep abreast of new devices and furnishings for self-learning systems and in-office classrooms, such as computer-driven blackboards and closed circuit TV tapes; keep in contact with educational specialists under his supervision and from outside educational institutions or corporations; relate his organization's needs for personnel training, retraining, and development to benefits and costs; and participate in new management development courses. Company devised and oriented training courses and corporation-developed training systems, such as VESI and TUTOR, are described. Various types of generalized programmed instructions or vast systems of computer-aided instruction are packaged commercially or customized for individual companies.

R202514X67A

Kleinschrod, Walter A
THE BIG NEW PUSH TO EDUCATE
Admin Mgt, Vol 28, No 8, pp 16-22, Aug 1967. 6 p, 2 photo
DESCRIPTORS-- *education/ *training/ efficiencies/ personnel/ programs/ technology/ responsibilities/ personnel management/ management/ computer programming/ administration/ communications/ costs/ concentration
IDENTIFIERS-- self-improvement/ management planning/ self-learning systems/ programmed instruction/ visual aids/ continuing education/ communication tools

R202520X67A MULTIPLYING YOUR EFFECTIVENESS

Some people accomplish more than others because they work more effectively. To achieve this effectiveness they: (1) know what they want to do and have a clear understanding of the end results and the time required to accomplish these results, (2) are sure their plans are compatible with those of their employers, and (3) inventory their ability to do the job confronting them. Ten characteristics common to people who work and act effectively are drive, responsibility, analytical ability, creative capacity, foresight, communicative skill, technical proficiency, resourcefulness, judgment, and sociability. Each characteristic is reviewed and advice given on how to obtain maximum results from a minimum expenditure of time and energy.

R202520X67A

Marvin, Philip
MULTIPLYING YOUR EFFECTIVENESS: A GUIDE TO COUNSELING YOUNG EXECUTIVES
Personnel Admin, Vol 30, No 5, pp 51-55, Sept-Oct 1967. U of Cincinnati, Ohio, 5 p
DESCRIPTORS-- management/ administration/ *motivation/ responsibilities/ analysis/ *creativity/ reasoning/ communications/ reliability/ flexibility/ efficiencies/ characteristics/ *leadership/ decision making/ training/ human engineering
IDENTIFIERS-- *goals/ performance/ *evaluation/ productivity/ professional advancement/ *professional development/ problem solving/ ability/ *ideas

R202521X67A PATHWAY TO PROFIT--AN INFORMATION SYSTEM

To a significant extent, the future profit picture of any business enterprise is the result of gathering concise, complete, accurate, and timely information and analyzing it intelligently for use in planning and decision-making processes. A management information system is a dynamic and organized method of developing the information needs of each manager within the organization and disseminating the data in such a way as to aid his understanding and stimulate action. The types of information needed by managers can be grouped into 3 major categories: (1) information for operation and control, (2) information to assess future action, and (3) information to assess or compare performance of the enterprise with competition within the industry. No system, data processing installation, or plant modernization alone can improve profits. To be effective, each function must operate within the framework of good management, which is always dependent on good information.

R202521X67A

Colbert, Bertram A
PATHWAY TO PROFIT: THE MANAGEMENT INFORMATION SYSTEM
Mgt Services, Vol 4, No 5, pp 15-24, Sept-Oct 1967. Price Waterhouse & Co, Chicago, Ill, 10 p, 28 fig
DESCRIPTORS-- *decision making/ *planning/ management/ administration/ data processing systems/ systems analysis/ methodology/ control/ computers/ data collection systems/ automation/ coordination/ requirements/ simulation/ charts/ graphical analysis/ operations/ records/ auditing
IDENTIFIERS-- *profits/ *information systems/ *management planning/ goals/ reports/ data elements

R202527X67A WAY TO BETTER SUPERVISION

Since the turn of the century, managers have been trying to find a scientific way to motivate employees to increased production. The author traces the historical sequence of steps taken to improve management, points out significant research findings, and discusses conditions necessary to optimize efficiency and effectiveness. Recent research has shown that: (1) motivation is important, (2) people act as they do in response to their own needs, (3) different viewpoints cause people to respond differently, (4) modern industrial society has more complex and psychologically oriented needs, and (5) people are best motivated by satisfying their needs through work. Managers can be more effective if they discuss with subordinates what goals are important and how to achieve them. Using theoretical considerations and practical experience, conclusions are that 2-way influence is more productive than 1-way influence and that systematic management is practicable.

R202527X67A

Wallace, Emmett and Shaw, Malcolm
REFINING THE ROUTE TO BETTER SUPERVISION
Chem Engg, Vol 74, No 19, pp 210-216, Sept 11, 1967. Educational Systems & Designs, Inc, Westport, Conn, 5 p, 4 ref
DESCRIPTORS-- *supervision/ management/ planning/ control/ *efficiencies/ organizations/ *motivation/ decision making/ human behavior/ analysis/ methodology/ standards/ compensation// behavior /psychology// engineering personnel/ employee relations/ *personnel management/ environment
IDENTIFIERS-- performance/ professional advancement/ problem solving/ working conditions/ productivity

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ADMINISTRATION AND MANAGEMENT

R202553X67A MANAGEMENT SCIENCE & INFORMATION SYSTEMS

The principal purpose of a management information system is to provide economically the information needed for planning, directing, evaluating, coordinating, and controlling the firm. The author relates earlier developments in management thought to modern organization views; discusses aspects of decision making, the systems concept, and man-machine systems; identifies the overall goals that an integrated information system should serve; suggests an approach to be followed by information system planners; and attempts to foresee how a widespread use of information systems may affect organization structure and management practice. Use of information systems will: (1) allow management more time for planning, since less time will be required for search and analysis of information; (2) enable management to evaluate the probable effect of different courses of action, assess the corresponding profit potentials, and anticipate the measures required to meet environmental changes external to the firm; and (3) effectively centralize the control of even the largest and most complex businesses. These benefits suggest that the question is not whether information systems should be used, but how to design and then employ the best one possible. Has 38 references.

R202553X67A

Dov, Aharon G Beged
MANAGEMENT SCIENCE, INFORMATION SYSTEMS, AND MANAGEMENT PRACTICE
IEEE Intl Convention Rec, Part 12, pp 83-93, N Y, N Y, Mar 1967. U of Toledo, Ohio, 11 p, 3 fig, 38 ref
DESCRIPTORS-- *decision making/ *systems analysis/ *planning/ management/ operations research/ scientific method/ coordination/ control/ simulation/ economics/ computers/ cost comparisons/ methodology/ characteristics/ data processing systems/ technology/ automation/ requirements/ bibliographies/ forecasting
IDENTIFIERS-- *information systems/ *systems engineering/ problem solving/ management planning/ goals/ reports

CIVIL ENGINEERING

R202544X67A CONCRETE COLLAR BRACES FOR LINING TUNNELS

Until recently, wooden collar braces were used between rib arches in tunneling practices in the USSR. Results of investigations and experiments using plant-manufactured reinforced concrete collar braces in construction of tunnels of the Ingursk Hydroelectric Powerplant are presented. These braces can be left in place when concreting tunnel linings, as they will not rot and form gaps between the rock and lining. Weight was an important design factor in the manufacture of the braces; each brace was not to exceed 16-20 kg. The method of manufacturing these braces is discussed, and a technical description with test results of experimental types of collar braces is given. Using reinforced concrete collar braces when driving nonpressure and pressure tunnels is recommended.

R202544X67A

Svanadze, P A
REINFORCED-CONCRETE COLLAR BRACES FOR LINING THE TUNNELS OF THE INGURSK HYDROELECTRIC POWER STATION. ASCE Hydrotech Construc, No 1, pp 17-20, Jan 1967. 4 p, 4 fig, 1 tab
DESCRIPTORS-- *tunneling/ *tunnel linings/ tunnel construction/ bracings/ foreign design practices/ reinforced concrete/ deflection/ manufacturing/ loads/ weight/ investigations/ bearing capacities/ laboratory tests/ pressure tunnels/ foreign construction
IDENTIFIERS-- USSR/ Ingursk Powerplant, USSR/ rock properties/ tunnel supports/ rock pressures

R202552 66A SOIL COMPACTION AROUND TUNNEL LININGS

CIVIL ENGINEERING

The extrusion-cast concrete lining method is being used for tunnels driven through soil by the shield method. As the shield moves forward, concrete is fed into the space between an adjustable mold and the rear hood of the shield. A force-distributing ring compresses the concrete which in turn compresses the soil around the tunnel until the reaction of the ground equals the compressive force. In designing these tunnels, reaction of previously compressed soil on the tunnel lining can be calculated if stress distribution and dimensions of the active deformation zone in the ground are known. Full-scale studies of the size of the deformed zone were conducted on an experimental length of tunnel at the Biryulevo Station, Moscow. Investigations showed that the deformed zone is of limited size, in spite of the relatively great pressure exerted directly on the surrounding soil.

R202552 66A

Dorman, I Ya
EXPERIMENTAL INVESTIGATION OF SOIL COMPACTION ROUND A TUNNEL WITH AN EXTRUDED CAST-IN-SITU LINING. Soil Mech & Fdn Engg, No 3, pp 207-208, May-June 1966. 2 p, 3 fig
DESCRIPTORS-- *tunnel construction/ tunnel design/ foreign construction/ *tunnel linings/ *soil compaction/ soil consolidation tests/ void ratios/ tunneling/ concrete/ heaving/ deformation/ concrete placing/ sewers/ loams/ soil pressures/ tunnels/ cast-in-place structures/ compression
IDENTIFIERS-- USSR/ Biryulevo sewer, Moscow/ *concrete linings/ sandy loams

R202494 67A FORM LUMBER EFFECTS ON CONCRETE SURFACES

CONCRETE TECHNOLOGY

Deleterious effects, apparently produced by form lumber in contact with freshly placed concrete, have been experienced in the field on several occasions. Some wood constituents may be deleterious to concrete. Laboratory tests indicated that failure of a concrete surface to harden when in contact with a wood form is directly dependent upon: (1) concentration of the wood's reactive constituents, such as polysaccharides, tannins, and aliphatic and fatty acids; (2) availability of mixing and curing water; and (3) temperatures of concrete and wood forms. Suspect lumber, such as lumber produced from trees cut in the spring, should be tested by casting mortar against samples of the lumber to determine whether a deleterious reaction will result. Lumber suspected of containing a concentration of deleterious reactive constituents should be treated with 1 or more applications of lime water to reduce the concentration of these constituents prior to use in forms. This precaution is particularly important if concrete is to be water cured. Form oils should be thoroughly applied to all wood forms, particularly in the joints of each form.

R202494 67A

Pepper, L and Derrington, Clara F
DELETERIOUS EFFECTS OF FORM LUMBER ON CONCRETE SURFACES
Tech Rept 6-785, U S Army Engr Wtrwys Exper Sta, Corps of Engrs, Vicksburg, Miss, July 1967. 24 p, 2 tab, 8 ref
DESCRIPTORS-- *forms /concrete// *concrete/ *lumber/ *concrete technology/ *surfaces/ wood/ chemistry/ temperature/ acids/ oils/ concrete placing/ curing/ organic compounds
IDENTIFIERS-- effect/ *deleterious materials/ cement hydration

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R202505 67A SONISCOPE TESTS ON CONCRETE DAMS

An evaluation of the soniscope as a diagnostic tool used in assessing concrete quality in structures is presented. Ultrasonic pulse velocity measurements were made on concrete dams in connection with the Portland Cement Association's development of the soniscope. Objectives of the program are to: (1) develop a nondestructive method for evaluating concrete quality, (2) explore the meaning of pulse velocity as it relates to concrete, and (3) obtain data for comparison with subsequent tests to determine if any changes are occurring in the concrete. Velocity measurements now may be made with an accuracy of 2% over paths up to 23 m long. Concrete deterioration may be detected by abnormally low velocities, a reduction in velocity over a period of time, or relatively large variations in velocity at different locations in the structure. Results from 10 of the 29 dams tested are discussed.

R202505 67A

McHenry, Douglas and Oleson, Calvin C
PULSE VELOCITY MEASUREMENTS ON CONCRETE DAMS
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 3, Ques 34, R 5, pp 73-89, Sept 1967. PCA, Skokie, Ill, 17 p, 11 ref
DESCRIPTORS-- *concrete dams/ *concrete testing/ ultrasonics/ longitudinal waves/ sonic waves/ concrete structures/ wave velocity/ inspection/ test procedures/ *nondestructive tests/ deterioration/ measuring instruments/ instrumentation/ cracking/ alkali-aggregate reaction
IDENTIFIERS-- *soniscopes/ ultrasonic tests/ Stewart Mtn Dam, Ariz/ Parker Dam/ Walters Dam, N C/ Matilija Dam, Calif/ Stony Gorge Dam, Calif/ Crystal Springs Dam, Calif/ Chickamauga Dam, Tenn/ *sonic velocity tests/ Arrowrock Dam, Idaho/ Norris Dam, Tenn/ Hiwassee Dam, N C

R202542X67A PETROGRAPHIC INVESTIGATIONS OF SAND

Rapid early stiffening of concrete having a very high water requirement caused difficulties during the construction of a large municipally owned hydroelectric project. Investigations showed that sand and gravel aggregates meeting ASTM specification requirements caused the early stiffening and high water requirement of the concrete. The sand suffered severe degradation during handling, mixing, and placing operations, producing a high percentage of fines containing a large amount of montmorillonoid clay minerals. Laboratory investigations featuring a special attrition test, mortar and concrete tests, petrographic analysis, absorption, specific gravity, and magnesium sulfate soundness test are described. The petrographic examination indicated that the sand was not suitable for high-quality concrete construction because of the presence of an abundance of deeply weathered and altered particles. Present ASTM specifications do not appear to be an adequate basis for judging the quality of concrete and mortar sands. The authors recommend that the specifications should include a petrographic report and an attrition test similar to the one described.

R202542X67A

Davis, R E; Mielenz, R C; Polivka, M
IMPORTANCE OF PETROGRAPHIC ANALYSIS AND SPECIAL TESTS NOT USUALLY REQUIRED IN JUDGING QUALITY OF CONCRETE SAND. Jour of Matls, Vol 2, No 3, pp 461-486, Sept 1967. U of California, Berkeley; Martin-Marietta Corp, Cleveland, Ohio, 26 p, 7 fig, 4 tab, 10 ref, disc
DESCRIPTORS-- *petrographic investigations/ *sands/ aggregates/ laboratory tests/ *fine aggregates/ concrete/ *concrete technology/ *stiffening/ test procedures/ slump/ portland cement/ specifications/ physical properties/ absorption/ specific gravity/ *abrasion/ degradation/ montmorillonites/ basalts/ acceptance tests/ *concrete testing/ materials testing/ mortars
IDENTIFIERS-- abrasion resistance/ abrasion method

R202543X67A CONCRETE WORKABILITY TESTS

CONCRETE TECHNOLOGY

The compacting factor, slump, Vebe consistometer, and settlement-time recorder used in conjunction with the Vebe apparatus are examined and compared as tests for determining the workability of fresh concrete. Results from experimental mixes show slump and compacting factor tests are not sensitive enough to show small variations in cement-water ratios. The Vebe consistometer is relatively more sensitive to small changes in mixes of medium workability and has good repeatability. Conversion of Vebe degrees and use of a settlement-time recorder were investigated as Vebe test modifications to improve Vebe test results. Conversion of Vebe time to Vebe degrees appears to be an unjustified refinement. The area under the settlement-time curve gives a measurement of cohesiveness rather than workability. Although these tests do not indicate all the individual properties collectively called workability, the Vebe test was found to give a very satisfactory indication of the ease in vibrating concrete into the shape of the formwork. Has 17 references.

R202543X67A

Hughes, B P and Bahramiam, B
WORKABILITY OF CONCRETE: A COMPARISON OF EXISTING TESTS
Jour of Matls, Vol 2, No 3, pp 519-536, Sept 1967. U of Birmingham, G B, 18 p, 9 fig, 2 tab, 17 ref
DESCRIPTORS-- *concrete/ *concrete testing/ *workability/ concrete placing/ concrete mixes// vibrators /mechanical// bibliographies/ compaction/ slump/ cohesion/ *consistency/ test procedures/ settlement/ water cement ratio/ concrete technology
IDENTIFIERS-- foreign testing/ foreign products/ Great Britain

R202515X67A VIBRATIONS FROM PILE DRIVING

CONSTRUCTION

Early investigations of vibration effect on structures were made by imposing vibrations directly on the structures; however, this method is impractical for typical construction sites surrounded by several structures. The Liberty Mutual Insurance Company, faced with the problem of these vibration effects, used ground vibration intensity as an indicator of potential structural damage. In 1936 the accelerograph was designed to measure and record ground vibrations resulting from construction operations. An energy ratio is calculated from the ground vibration recordings. Energy ratios above 6 are potentially damaging to structures. In pile driving, plotting energy ratio vs pile tip penetration with measurements at various distances is customary. When energy ratios above the safe level are encountered, proper precautions often can be taken to bring the energy ratio into the safe range.

R202515X67A

Luna, William A
AN ANALYSIS OF REPORTS ON GROUND VIBRATIONS DUE TO PILE DRIVING
Foundation Facts, Vol 3, No 2, pp 3-5, 1967. Liberty Mutual Ins Co, N Y, N Y, 3 p, 7 fig, 1 tab
DESCRIPTORS-- *vibrations/ *pile driving/ *accelerographs/ accelerometers/ structures/ buildings/ construction/ safety/ frequency/ longitudinal waves/ transverse waves/ shock waves/ seismic investigations/ energy/ *damages/ seismographs/ *piles/ *pile foundations
IDENTIFIERS-- ground amplitude/ ground particle velocity/ vibration tests

R202519X67A OPEN-PIT BLASTING PRACTICE

Open-pit blasting methods have undergone a drastic revolution in the past 25 yr. Large diameter boreholes and the use of ammonium nitrate fuel oil (AN/FO) and slurry blasting agents (SBA) have largely replaced the conventional dynamite loaded into small size boreholes. Although AN/FO is actually an inferior blasting agent, its success is attributable to its low cost, safety, and easy formulation and handling. Slurry blasting agents consist of a saturated ammonium nitrate solution mixed with a sensitizing material. The sensitizing material may be a nonexplosive combustible material or an oxygen deficient explosive such as TNT or smokeless powder. Slurry explosives are safe to handle as they are not easily ignited and are difficult to detonate without powerful boostering. Uses of AN/FO and SBA, automation in bulk handling, and economies in blasting are discussed. Commercial applications of nuclear explosives now in the planning stage may have advantages in large single-shot operations; however, most of these applications probably could be performed more economically with the new automated slurry systems in conjunction with modern automated construction methods. Has 22 references.

R202519X67A

Melvin, A; Garfield, M; Cook, Vernon O
MODERN OPEN-PIT BLASTING PRACTICE
Engg & Min Jour, Vol 168, No 9, pp 117-122, Sept 1967. IRECO Chemicals, Salt Lake City, Utah, 6 p, 2 fig, 3 photo, 1 tab, 22 ref
DESCRIPTORS-- blasts/ *explosives/ *mining/ quarrying/ nuclear explosions/ bibliographies/ detonation/ construction/ excavation/ handling equipment/ slurries/ automation/ costs// *charges /explosives// economies/ boreholes/ safety/ underground explosions/ fuel oils/ *rock excavation
IDENTIFIERS-- *open pit mining/ *ammonium nitrate/ *blasting

R202528X67A ENGINEERING CONSTRUCTION CONTRACTS

Based on today's economic conditions, a critical analysis is made of 12 different types of agreements used between contractors and operating companies. A selection chart evaluating the advantages, disadvantages, and most appropriate applications of these important types of contractual agreements for design and construction work is included. Relative popularity of the various types of agreements is discussed and latest trends in contract use in the U S and overseas are examined. Type of financing for domestic projects generally has little influence on the choice of contract form; however, project financing is a very important phase of contract selection for small foreign companies or government-owned monopolies in semideveloped countries. When a lending agency requires a detailed project execution plan, the contract form can be influenced considerably by the borrower's credit rating.

R202528X67A

Gallagher, John T
A FRESH LOOK AT ENGINEERING CONSTRUCTION CONTRACTS
Chem Engg, Vol 74, No 19, pp 218-224, Sept 11, 1967. Mobile Oil Corp, N Y, N Y, 6 p, 1 fig, 1 tab
DESCRIPTORS-- *contracts/ contract administration/ construction/ analysis/ agreements/ contracting/ negotiations/ costs/ finance/ economics/ design/ industries/ foreign construction/ engineering/ competitive bidding
IDENTIFIERS-- legal aspects/ incentives/ incentive contracting/ selection/ *evaluation

R202485X67A DERWENT DAM THE TEACHER

Derwent Dam, located on the Derwent River in a remote area of Northern England, is a 3000-ft-long, 119-ft-high earthfill structure containing 2.6 million cu yd of fill. The dam was built to provide 21 million gal of water per day for 2 local water companies. After construction started, design of the dam was changed from the original concrete-type cutoff to a clay blanket. Borehole explorations indicated a considerable depth of glacial deposit overlying a rock formation. During the first year of construction, contractors found 3 aquifers containing artesian water beneath the laminated clay stratum; dewatering one had little effect on flow of the others. Seven of 13 relief wells constructed at the downstream toe of the dam now provide approximately 10% of the statutory compensation water flowing downstream. Elaborate instrumentation was installed to check movements and pore pressures within the dam. A 60-kw hydraulic driven unit passes most of the downstream water requirement and supplies local electric power, as well as some excess which is fed into the public supply. The dam, construction areas, and reservoir have been landscaped carefully to blend with the surrounding countryside and are designated recreation areas.

R202485X67A

Anonymous
DERWENT DAM THE TEACHER
Engineering, Vol 204, No 5284, pp 140-144, July 28, 1967. 5 p, 13 fig
DESCRIPTORS-- *earth dams/ dam foundations/ dam design/ *cutoffs/ boats/ aquifers/ artesian water/ instrumentation/ glacial deposits/ construction/ clays/ foreign construction/ aesthetics/ recreation/ fish/ reservoirs/ boreholes/ geology/ *cutoff walls/ impervious blankets
IDENTIFIERS-- *landscaping/ dam stability/ *site selection/ Great Britain/ Derwent Dam, Gt Brit

R202493X67A BAJINA BASTA DEVELOPMENT--YUGOSLAVIA

The largest hydroelectric project in Yugoslavia is the 360-mw Bajina Basta Development. Located on the Drina, the country's second most important river for power potential, it is a project of major importance. Topography and geology of the area are described. To develop maximum river potential, 19 plants will be constructed eventually on the main stream with a number of others on the tributaries. Geology of the damsite is very complex, and considerable grouting was required to give a watertight foundation. As the foundation has a low modulus of elasticity (about 4000 kg/sq cm), a Marcello-type hollow-buttress dam with enlarged footings was necessary to give low foundation pressures. Construction and instrumentation of the dam, sliding joint between the dam and toe of the dam powerplant, penstocks and roller gates, semioutdoor powerplant construction, spiral cases, and mechanical and electrical equipment are described. The main circuit diagram of the Bajina Basta Powerplant and Beserovina Switchyard is included, and names of manufacturers of all major mechanical and electrical equipment are given.

R202493X67A

Anonymous
THE BAJINA BASTA DEVELOPMENT
Water Pwr, Vol 19, No 6-7, pp 219-225 & 261-265, June & July 1967. 12 p, 18 fig
DESCRIPTORS-- *hydroelectric powerplants/ dam foundations/ concrete dams/ optimum development plans/ geology/ dam design/ *river basin development/ foreign projects/ hydrologic data/ instrumentation/ grout curtains/ power transformers/ geologic investigations/ electric generators/ aggregates/ hydraulic turbines/ hydraulic machinery/ grouting/ pozzolans/ *buttress dams/ Francis turbines// switchyards /electrical/
IDENTIFIERS-- Yugoslavia/ *Bajina Basta Dam, Yugosl/ site selection/ Drina River, Yugoslavia

R202497 67A LEAKAGE AT FONTENELLE DAM

The safety of Fontenelle Dam in Wyoming was threatened in 1965 when a substantial leak developed on the downstream face of the embankment at the right abutment contact. The leakage path was found to be through the abutment, although the first impression was that it was through the dam or along the contact. Emergency measures consisted of opening the main outlet which had been closed for minor repair and opening outlets on both abutments leading to canal systems that had not been constructed. The prompt action lowered the reservoir before erosion from the flow could cause a breakthrough. The difficulty occurred on first filling of the reservoir, unusually rapid because of extremely large inflows. Repairs consisted of thorough grouting of the foundation and restoration of the embankment damaged by the sudden flow. The experience illustrates the need for slow, controlled filling of reservoirs where unfavorable foundation conditions are known to exist. Foundation conditions, design, and construction practices are examined to determine why this situation developed despite the precautions taken in the original design and construction because of known unfavorable geologic conditions. Modifications needed to prevent a recurrence at this dam and other similar sites are discussed.

R202497 67A

Bellport, B P
BUREAU OF RECLAMATION EXPERIENCE IN STABILIZING EMBANKMENT OF FONTENELLE EARTH DAM. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 5, pp 67-79, Sept 1967. Bureau of Reclamation, Denver, Colo, 13 p, 3 fig
DESCRIPTORS-- *earth dams/ *embankments/ *leakage/ abutments/ *repairing/ grouting/ dam design/ foundations/ foundation failures/ geology/ bedrocks/ foundation investigations/ geologic investigations/ reservoir operation/ damages/ stress relieving/ underseepage/ dam failures/ engineering geology/ seepage
IDENTIFIERS-- *Fontenelle Dam, Wyo// *piping /erosion// jointed rock

R202499 67A UPLIFT PRESSURES IN RESERVOIR SLOPES

During initial filling of Gepatsch Reservoir, Austria, extensive slope movements were observed along the western slope. Volume of the slope mass in movement was estimated at 20 million cu m. The geological situation at the basin, laboratory tests, field measurements and observations, model tests, and theoretical studies are described. The investigations revealed that uplift pressure produced by filling the reservoir was the main cause of slope movements. Model tests and calculations indicated that through a process of slow deformation the slope is adapting to load conditions modified by the reservoir level. Forecasts of further movements were made and checked during a second filling of the reservoir. Under strict surveillance, the full reservoir level was reached step by step in 2 further filling periods.

R202499 67A

Lauffer, H; Neuhauser, E; Schober, W
UPLIFT RESPONSIBLE FOR SLOPE MOVEMENTS DURING THE FILLING OF THE GEPATSCH RESERVOIR. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 41, pp 669-693, Sept 1967. Tiroler Wasserkraftwerke AG, Innsbruck, Austria, 25 p, 9 fig, 2 tab, 7 ref
DESCRIPTORS-- reservoirs/ *slopes/ *earth movements/ valleys/ engineering geology/ geologic investigations/ model tests/ rheology/ moraines/ talus/ glacial deposits/ *uplift pressures/ movements/ sliding/ buoyancy/ *slump/ measurement/ measuring instruments/ galleries/ alluvial deposits/ foreign projects/ *landslides
IDENTIFIERS-- *slope stability/ slip surface/ *rockslides/ Gepatsch Reservoir, Austria/ Austria

R202503 67A BRATSK DAM STRUCTURAL BEHAVIOR

The Bratsk Dam is a concrete gravity structure of triangular cross section with a maximum height of 126 m. It is located in the region of Eastern Siberia where the annual mean air temperature is -2.7 deg C, extreme temperatures are -58 deg C and +35 deg C, and the frost period continues for more than 6 months. A continuous observation program calls for measurement of the temperature; strain and stress in the concrete; and settlement, deflections, and uplift of the dam. The stress condition is affected by temperature changes and dead weight of the structure. Influence of hydrostatic pressure on stresses measured by strain meters is slight; cracking in the concrete occurred mostly on the surface at an early age. Maximum settlement of the dam is 63 mm and is expected to reach 73 mm. Deflections of the dam are seasonal because of temperature variations. Irreversible downstream deflections are caused by hydrostatic pressure and temperature variations.

R202503 67A

Eidelman, S Ya and Vedeneev, B E
MEASUREMENTS OF DEFORMATIONS AND STRESSES ON THE BRATSK DAM ON THE ANGARA RIVER. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 3, Ques 34, R 32, pp 571-590, Sept 1967. VNIIG, Leningrad, USSR, 20 p, 6 fig, 2 tab, 14 ref
DESCRIPTORS-- *concrete dams/ *measurement/ *deformation/ *stress/ weight/ cold weather operations/ temperature/ dam design/ foreign design practices/ foreign construction/ displacements/ settlement/ loads/ deflection/ cracks/ *strain measurement/ cracking/ strain gages/ *structural behavior/ thermal stress/ reservoir operation/ instrumentation/ gravity dams
IDENTIFIERS-- *Bratsk Dam, USSR/ USSR/ cold climates

R202504 67A DAM FAILURE CAUSES

Knowledge of causes leading to the destruction of dams is incomplete, and further progress must be based upon a close study of the mechanism of failure. Our knowledge has not yet reached the stage when the safety of a dam can be secured by following a uniform code of practice. Every dam, whether natural or man-made, interferes with the established equilibrium of nature and gives rise to slow changes eventually leading to the restoration of the natural potential gradients interrupted by the dam. The risk of disaster is forever inescapable, and while knowledge and vigilance may reduce such a risk, it can never be banished entirely. Although dams are designed on the assumption of a system of static loads, they are in fact subject to slow dynamic change and should be observed throughout their period of service.

R202504 67A

Gruner, Edward
THE MECHANISM OF DAM FAILURE
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 3, Ques 34, R 12, pp 197-206, Sept 1967. 10 p
DESCRIPTORS-- *dam failures/ safety/ dams/ disasters/ *foundation failures/ defects/ deformation/ seepage/ leakage/ grouting/ abutments/ flood damages/ flood/ costs/ grout curtains/ earthquakes/ uplift pressures/ inspection/ dam foundations// failure /mechanics// earth dams/ arch dams/ concrete dams
IDENTIFIERS-- piping /erosion/

R202506 67A SPILLWAY AND OUTLET DAMAGES

Specific examples of erosion and structural damage sustained by spillways and outlets at Bureau of Reclamation dams are reported. At 2 large dams, concrete-lined spillway tunnels used for river diversion during construction suffered extensive erosion from river gravel and construction debris churned in the turbulent hydraulic jump. Rock debris fallen or thrown into a spillway hydraulic jump stilling basin caused extensive erosion of the floor, walls, and dentates. An example is cited of serious cavitation damage to concrete surfaces in hydraulic jump outlet stilling basins caused by improperly installed outlet gates and poor workmanship. At 3 projects, erosion and structural problems were encountered with high-efficiency hollow-jet valve stilling basins. Channel riprap was dislodged and conveyed by reverse roller action into the basin, devastating the basin floor and walls. The intense turbulence in hollow-jet valve basins imposes high dynamic forces on divider walls, producing high bending moments and vibrations approaching a resonance condition. The knowledge gained from these experiences has led to changes in design and construction procedures for stilling basins. Techniques for corrective and preventive maintenance are discussed.

R202506 67A

Arthur, H G and Jabara, Melvin A
PROBLEMS INVOLVED IN OPERATION AND MAINTENANCE OF SPILLWAYS AND OUTLETS AT BUREAU OF RECLAMATION DAMS. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 2, Ques 33, R 5, pp 73-93, Sept 1967. Bureau of Reclamation, Denver, Colo, 21 p, 4 fig
DESCRIPTORS-- *spillways/ *outlet works/ *erosion/ cavitation/ maintenance/ damages/ riprap/ gravels/ diversion tunnels/ turbulence/ hydraulic jumps/ hollow jet valves/ *stilling basins/ energy dissipation/ hydraulic models/ resonance/ vibrations/ design criteria/ operation and maintenance/ *scour/ hydraulic structures/ dentated sills/ dams
IDENTIFIERS-- concrete linings/ Bureau of Reclamation/ design improvements/ dynamic loads

R202507 67A SAFETY OF DAMS PROGRAM OF THE USBR

The broad experience gained by the Bureau of Reclamation in constructing and operating over 200 storage dams in the 17 Western States has resulted in a comprehensive system of procedures to assure their safety. All criteria and instructions for operation and maintenance of each dam are being assembled in a volume containing: (1) administrative procedures for reporting, decision making, and coordinating with other agencies; (2) detailed information and instructions on the operation and maintenance of the dam and related facilities; and (3) reservoir operating criteria including storage allocations, filling and release procedures, hydrologic forecasting, and flood operating criteria. Maintenance at each dam is reviewed by project supervisors and engineers periodically. A program is in progress to review flood hydrology for older dams to determine adequacy of spillways. Consideration is given to geologic and seismic conditions and possible alkali-aggregate reaction in concrete at older structures. The competence of dams designed and constructed by local interests above Reclamation dams is being cooperatively reviewed. Reclamation is urging Federal legislation to assist in preventing and correcting dangerous conditions at all storage dams.

R202507 67A

Dominy, Floyd E
THE SAFETY OF DAMS PROGRAM OF THE BUREAU OF RECLAMATION
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 2, Ques 33, R 4, pp 57-72, Sept 1967. Bureau of Reclamation, Washington, D C, 16 p, 2 tab, append
DESCRIPTORS-- *safety/ *dams/ *concrete dams/ operation and maintenance/ *earth dams/ instruction/ operations/ maintenance/ seismic design/ laws/ spillways/ alkali-aggregate reaction/ hydrologic data/ landslides/ programs
IDENTIFIERS-- Bureau of Reclamation/ irrigation districts/ operating criteria/ standing operating proced/ hydrothermograms

R202508 67A SEISMIC DESIGN CRITERIA FOR CONCRETE DAMS

Any dam may be subjected to seismic disturbance of unknown intensity during its useful life. The engineer must consider earthquakes in his design and provide sufficient resistance to this phenomenon. Three major problems are encountered when selecting design criteria for concrete dams subjected to earthquake: (1) a method for analyzing the dynamic response of the structure and the resulting loads, (2) a definition of structural failure under seismic loads, and (3) selection of criteria based on these items. Based on the premise that concrete dams are elastic structures and can be excited to resonance by earthquakes, a method is presented for determining dynamic loads and computing the resulting stresses. The earthquake response spectrum concept is used, and hydrodynamic effects, structural damping, and dynamic response of the dam are included. Results of a controlled vibration test are compared with estimated dynamic properties for one arch dam. The possibility and degree of structural failure are investigated because of the development of relatively large stresses from dynamic loading. Design criteria are proposed, based on compressive strength of concrete as the most important measure of the strength of the dam.

R202508 67A

Copen, Merlin D
SELECTION OF DESIGN CRITERIA FOR CONCRETE DAMS SUBJECTED TO SEISMIC ACTION
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 4, Ques 35, R 14, pp 239-258, Sept 1967. Bureau of Reclamation, Denver, Colo, 20 p, 7 fig, 12 ref
DESCRIPTORS-- *concrete dams/ *dam design/ *seismic design/ damping/ elastic deformation/ earthquakes/ *design criteria/ natural frequency/ resonance/ vibrations/ compressive strength/ tensile strength/ structural stability/ stress/ arch dams/ dynamics
IDENTIFIERS-- seismic stability/ dynamic stability/ earthquake loads/ dynamic tests/ *earthquake engineering/ earthquake-resistant struct

R202510 67A SEISMIC ANALYSIS OF EARTH DAMS

Rational, analytical methods of design have yielded an increased understanding of dynamic conditions affecting dam stability. A statistical approach to prediction of earthquake magnitude at a given site is available, and knowledge of soil strength under dynamic conditions is expanding rapidly. Although a statistical study of earthquake probability is a prerequisite to seismic design of an earth dam, the engineer must realize limitations of the study and use good judgment in applying results. Probability data extracted from earthquake historical records showing only minor activity in an area must be adjusted if the geological evidence indicates extensive fault movement during recent geological times. Results of the seismic stability analysis will indicate extent of design modifications desirable to increase the safety factor of the proposed section. Where excessive displacements are indicated, the embankment slope should be flattened, increased densities should be specified and, if necessary, shell material should be processed to remove fines. Further research on seismic characteristics is required to enable the engineer to decrease the available range of each parameter to be assumed for his analysis. Among the most influential on earth dam behavior are the frequency and duration of vibrations. Gives 30 references.

R202510 67A

Stone, A A and Smith, E S
PRACTICAL APPLICATION OF DYNAMIC CRITERIA TO SEISMIC ANALYSIS OF EARTH DAMS
Paper, Trans, 9th Intl Cong on Large Dams, Vol 4, Ques 35, R 15, pp 259-280, Istanbul, Turkey, Sept 1967. Intl Engg Co, Inc, San Francisco, Calif, 22 p, 6 fig, 2 tab, 30 ref
DESCRIPTORS-- *earth dams/ *seismic design/ dynamics/ *rockfill dams/ model tests/ soil physical properties/ earth movements/ earthquakes/ embankments/ structural behavior/ probability/ displacements/ bibliographies/ design criteria/ vibrations/ shear stress/ *dam design/ safety factors/ slopes
IDENTIFIERS-- *seismic stability/ dynamic tests/ *dynamic stability// acceleration /mechanical// epicenters/ *earthquake-resistant struct/ design earthquake/ earthquake engineering

R202530X67A RIVER DIVERSION AT FURNAS

River control works, comprising cofferdams, 2 diversion tunnels, and a prediversion channel, were used to divert the Rio Grande prior to construction of the rockfill dam for Brazil's 1200-mw Furnas hydroelectric development. A prediversion channel in the right bank was provided so that work in the deep-faulted section of the riverbed could begin at an early date. This channel passed floods of 2700 cu m/sec. Site geology, riverflows, frequency and volume of floods, river control, cofferdams, model studies and flow tests, and diversion tunnel construction are discussed. The twin horseshoe-shaped diversion tunnels, each with an average cross section of 171 sq m and lengths of 885 and 806 m respectively, were driven through quartzitic rock of the left bank. The tunnels were lined with reinforced sprayed concrete supported by rockbolting. Maximum recorded flow through the tunnels was 4040 cu m/sec and occurred during Feb 1961.

R202530X67A

MacGregor, W; Lee, T A; Hancock, P H D
RIVER DIVERSION AT FURNAS
Water Pwr, Vol 19, No 9, pp 377-386, Sept 1967. George Wimpey & Co Ltd, London, G B, 10 p, 15 fig, 3 tab, 5 ref
DESCRIPTORS-- *diversion tunnels/ diversion/ *cofferdams/ streamflow/ *river closures/ river basin development/ rockfill dams/ hydroelectric power/ rock bolts/ flood/ flood peaks/ tunnels/ tunnel linings/ hydraulic models/ model tests/ hydraulics/ roughness coefficients/ velocity/ river regulation/ foreign construction/ geology
IDENTIFIERS-- Brazil/ Furnas Dam, Brazil/ *concrete linings

R202531X67A EARTHQUAKE LOADS ON BUTTRESS DAMS

An analytical study showing use of the finite element method for vibration and stability analysis of buttress dams is presented. Salient points of the method are reviewed and an example of an Ambursen-type dam with variable web thickness is given. Relative stiffness of a buttress dam in the transverse direction, coupled with flexibility along the longitudinal axis, allows vibrations to be studied as those of supported plates subject to flexure. Only the elastic response is determined. Focusing attention on natural vibrations simplifies design changes to minimize response effects. Once free vibration frequencies and modes are known, standard methods are available for computing the response to any specific motion. Basic procedures for determining the response to a specific earthquake are summarized in an appendix.

R202531X67A

Zienkiewicz, O C; Anderson, G; Irons, B
BUTTRESS DAM ANALYSIS FOR EARTHQUAKE LOADS
Water Pwr, Vol 19, No 9, pp 359-362, Sept 1967. U of Wales, Swansea, G B, 4 p, 6 fig, 6 ref
DESCRIPTORS-- *buttress dams/ concrete dams/ *stability analysis/ computer programming/ mathematical analysis/ computation/ natural frequency/ *dam design/ earthquakes/ *vibrations/ matrix algebra/ foreign design practices
IDENTIFIERS-- *finite element method/ earthquake engineering/ *earthquake loads/ Great Britain

R202556X67A ARCH DAM DESIGN FACILITATED BY COMPUTER

A computer application is used to simplify the layout of a variable thickness, double-curvature arch dam. With prescribed though flexible relationships given for the angles subtended, thickness variation, and crown-to-abutment overhang, a computer program determines the centers and radii of intrados and extrados arcs and cross-sectional dimensions. In this way, a rapid evaluation of the many factors affecting dam geometry can be made. To demonstrate the technique, results are tabulated for a 675-ft-high arch dam with defined contours. A graphical representation of the computer layout and the idealized profile superimposed on the estimated profile are shown. These profiles closely approximate the valley. The procedure outlined is one of many and was selected because the engineer starts the design with optimum subtended angles. Usually a single trial is sufficient to determine whether these angles can be maintained without excessive vertical curvature. Necessary modifications can be spotted easily. This procedure simplifies the difficult task of satisfying tensile strength requirements and can be used as a basis for a grid analysis or field survey, since any point can be defined precisely.

R202556X67A

Parme, Alfred L
ARCH DAM LAYOUT FACILITATED BY USE OF COMPUTER
ASCE Proc, Jour Pwr, Vol 93, No PO2, Paper 5523, pp 69-85, Oct 1967. Portland Cement Assoc, Chicago, Ill, 17 p, 8 fig, 4 tab, 1 ref, 2 append
DESCRIPTORS-- *arch dams/ *dam design/ structural design/ dams/ computer programming/ concrete dams/ hydraulic structures/ locations/ shell structures/ abutments/ contours/ stress analysis/ analysis/ deformation/ cross sections/ hydrostatic pressures/ graphical analysis/ loads/ moments/ thickness/ geometry/ stress/ tensile strength
IDENTIFIERS-- curvature/ design practices/ double-curvature arch dams

R202486X67A RANNEY METHOD LIFTS WATER FROM AQUIFERS

Using the Ranney method, a water well system can be developed in alluvial deposits of sand and gravel along riverbeds. The installation consists of sinking a reinforced concrete caisson through sand and gravel to an impermeable layer and then jacking slotted pipes horizontally in radial directions into the surrounding alluvial material. During the jacking of the slotted pipes, surrounding gravels are desanded to form an infiltration gallery. A pumphouse with control equipment, valve controls, and recording equipment is constructed on top of the caisson extending several feet above ground level. This arrangement prevents floodwater from entering the caisson or pumping station and polluting the filtered water. A single Ranney collector can produce as much water as several standard wells and the yield will not deteriorate because of silting or encrustation. As the collector draws from natural underground storage or water infiltrated from an underground river, there is usually no need to establish any surface storage. Steps for installing a collector with its equipment and a method of operation are described.

R202486X67A

Drinkwater, J S
THE RANNEY METHOD OF ABSTRACTING WATER FROM AQUIFERS
Water & Water Engg, Vol 71, No 857, pp 267-274, July 1967. Humphreys & Glasgow Ltd, London, G B, 7 p, 6 fig, 4 photo, 2 ref
DESCRIPTORS-- *aquifers/ *ground water/ pipes/ caissons// filters /fluid// pumps/ water yield/ tunneling/ slots/ filtration/ collecting method/ water supplies/ *wells/ alluvial deposits
IDENTIFIERS-- *Ranney collector/ pumping tests/ perforations/ jacking/ radial collector wells/ site selection/ Great Britain/ water wells

R202496X67A ALUMINUM SHEATH EXTRA-HIGH-VOLTAGE CABLES

Siemens AG, Berlin, Germany, has developed a sheathing press for manufacturing aluminum-sheathed power and telecommunications cables. During the past 10 yr, 15,000 km of cable have been manufactured and tested in European installations. Advantages of aluminum- over lead-sheathed cables are: (1) aluminum is stronger mechanically; (2) electrically, aluminum has higher conductivity, thus making possible the use of aluminum sheathing as a neutral conductor in 3-phase cables and offering a substantial savings in cost; (3) aluminum-sheathed cable is lighter per unit length; (4) aluminum offers better shielding effects for communications cables; and (5) aluminum-sheathed cable is more economical. The only disadvantage of aluminum over lead is that it is more sensitive to corrosion; however, with the reliability and quality of anticorrosion protective coverings this disadvantage becomes almost nonexistent. A general review of the use of aluminum as sheathing material for single-conductor, extra-high-voltage cables is given. Relative merits of oil-filled aluminum- and lead-sheathed cables are discussed and jointing methods described.

R202496X67A

Muller, U and Held, Ch
EXTRA HIGH VOLTAGE CABLES WITH ALUMINUM SHEATH
Paper 31 CP 67-480, IEEE Summer Pwr Mtg, Portland, Oreg, July 1967.
Siemens AG, Berlin, Germany, 15 p, 8 fig, 4 ref
DESCRIPTORS-- *extra high voltage/ *electric cables/ *aluminum/ *sheathing/ corrosion/ corrosion control// lead /element// electrical conductance/ joints/ foreign design practices/ mechanical properties/ electric power/ electrical properties/ thermal properties/ economies/ reliability/ losses/ costs/ weight
IDENTIFIERS-- Germany/ *power cables/ foreign research

R202518 66A NONSUSTAINED BREAKDOWNS IN DIELECTRICS

For over 50 yr, preliminary or pilot sparks have been observed with alternating voltages during breakdown tests of gaseous and liquid insulation. Frequently occurring in oil gaps, these sparks usually were regarded as spurious and the higher voltage resulting in the sustained flow of current was recorded as the dielectric strength. Although this practice has been accepted in many standards, recent findings indicate preliminary sparks observed across long insulator strings and rod-rod gaps result in a momentary collapse of voltage to near zero across the test object. The more general occurrence of the sparking phenomenon is demonstrated, and the question of which breakdown voltage should be used to designate the dielectric strength is reconsidered. Sustained and nonsustained breakdowns are defined and oscillograms of typical breakdown phenomena for SF6 and transformer oil are included.

R202518 66A

Darveniza, M
NONSUSTAINED BREAKDOWNS IN ELECTRICAL STRENGTH TESTS
Paper, 1966 Ann Rept, Conf on Elec Insulation & Dielec Phenomena, pp 39-44, Pocono Manor, Pa, Oct 1966. Westinghouse Res Labs, Pittsburgh, Pa, 6 p, 4 fig, 2 tab, 8 ref
DESCRIPTORS-- alternating currents/ *dielectrics/ electric potential/ test procedures/ *electric insulation/ electric arcs/ electrodes/ experimental data/ standards/ electrical engineering/ capacitors/ resistors/ oils/ contamination// transmission /electrical// sparks
IDENTIFIERS-- *breakdown/ *insulating oil/ *sulfur fluorides/ switching surges/ electrical insulators/ test results/ polarity

R202540X67A INSULATION CHARACTERISTICS OF EHV LINES

Results of tests for the insulation design of the first 500-kv transmission line in Japan are described. These tests were conducted on a full-scale transmission line constructed near the seashore where insulators are exposed to salt contamination. The contamination lowers the withstand voltage of insulators and causes earlier flashover. Switching surge and impulse flashover characteristics of V-string and strain insulator assemblies were clarified and the insulators installed on a simulated tower with a long gap of 3 m or more. Tower insulation capable of unbalanced insulation between vertically arranged double circuits was designed to withstand a switching surge of 2.5 per unit. Tests included the investigation of impulse flashover voltage characteristics, switching surge flashover voltage characteristics, switching surge flashover path, and predischarges. Tables and graphs of test results are presented.

R202540X67A

Saruyama, Y; Yasui, M; Ikeda, G, et al
500-KV LINE DESIGN: I--INSULATION CHARACTERISTICS OF TOWERS
IEEE Trans, Vol PAS-86, No 9, pp 1083-1090, Sept 1967. Tokyo Elec Pwr Co, Japan; Sumitomo Elec Ind, Ltd, Osaka, Japan, 8 p, 14 fig, 2 tab, 11 ref, append, disc
DESCRIPTORS-- *extra high voltage/ *transmission lines/ *electric insulation/ design/ clearances/ foreign design practices/ characteristics/ lightning/ test procedures/ electrical coronas/ radio interference/ surges/ test facilities/ contamination
IDENTIFIERS-- switching surges/ Japan/ electric discharges/ *flashover/ test transmission lines/ *electrical insulators

R202541X67A CORONA & RIV CHARACTERISTICS OF EHV LINES

Corona noise, produced by conductors and insulator hardware, causes radio interference on power transmission lines. Noise characteristics of insulator-hardware assemblies used in designing the first 500-kv transmission line in Japan are described. Results of corona noise measurement made on V-string and strain insulator assemblies are compared for: (1) insulators only, (2) insulators with an arcing horn, and (3) insulators with an arcing horn and shielding rings. Data on the corona noise level of insulator hardware, obtained from a test line, were converted into noise level values for an actual transmission line and compared with conductor noise levels; insulator-hardware design for the 500-kv line was decided accordingly. Corona noise level measurements were made under both dry and wet conditions.

R202541X67A

Saruyama, Y; Yasui, M; Nagasaki, S
500-KV LINE DESIGN: II--CORONA AND RIV CHARACTERISTICS OF INSULATOR-HARDWARE ASSEMBLIES. IEEE Trans, Vol PAS-86, No 9, pp 1091-1097, Sept 1967. Tokyo Elec Pwr Co, Japan; Sumitomo Elec Ind, Ltd, Osaka, Japan, 7 p, 12 fig, 1 tab, 8 ref, append, disc
DESCRIPTORS-- *electrical coronas/ *radio interference/ characteristics/ *extra high voltage/ transmission lines/ foreign design practices/ design/ test facilities/ test procedures/ magnetic fields/ shielding/ high frequency/ electric insulation/ noise/ electric cables
IDENTIFIERS-- Japan/ *electric discharges/ test transmission lines/ electric conductors/ electrical insulators

R202498 67A FOUNDATION DEFORMATION & ARCH DAM DESIGN

Foundation and structural behavior studies on the arch section of Alto Rabagao Dam are summarized. Located in Northern Portugal, the dam is a 94-m-high, double-curvature, asymmetric cupola. The foundation rock is granite and ranges from good condition in the right bank to a kaolinized and highly deformable condition in the left bank. Ratio of foundation rock to dam concrete modulus of elasticity ranged from 1:1 on the right bank to 1:20 under the left abutment. A rock quality index based on water absorption was correlated with mechanical properties and used to reduce the number of tests and to evaluate rock properties during excavation. Model tests of dam shapes with variations in foundation conditions showed that high deformability in the left bank caused high-tensile stresses parallel to the foundation surface in the downstream face near the left bank foundation and near the lower part of the right bank on the upstream side. These high-tensile stresses were almost entirely offset by choosing shapes to increase the thickness and weight of the dam. The authors contend that an arch dam is less expensive and safer than a gravity dam; contrary to current opinion, an arch dam does not require better foundations in regard to deformability or strength.

R202498 67A

Rocha, Manuel; da Silveira, A F; Azevedo, M C Cruz; Lopes, J Baptista
INFLUENCE OF A VERY HIGH DEFORMABILITY OF THE FOUNDATION ON THE CONCEPTION AND BEHAVIOUR OF AN ARCH DAM. Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 28, pp 441-461, Sept 1967. LNEC, Lisbon, Portugal, 20 p, 11 fig, 2 tab, 5 ref
DESCRIPTORS-- *dam design/ *arch dams/ *dam foundations/ foundation investigations/ *structural models/ model tests/ granites/ deformation/ elasticity modulus/ tensile stress/ foreign projects/ foreign design practices/ abutments/ absorption/ index tests/ stress analysis/ rock foundations/ safety
IDENTIFIERS-- rock properties/ rock alteration/ double-curvature arch dams/ Alto Rabagao Dam, Portugal/ Portugal

R202500 67A DEEP CUTOFF SLURRY TRENCHES

Cutoffs for dams using the open cut compacted core trench method become expensive or impractical when the foundation alluvium is deep or dewatering is difficult. In situations requiring a deep cutoff, the slurry trench method has proved successful in a number of cases. The method consists of excavating, in the wet, a trench with vertical sides supported by bentonite slurry. As materials are removed from the trench, sufficient slurry is added so that the trench always remains full. After a length of trench has been excavated, backfilling with selected materials is started while the slurry is still in the trench. Design of a slurry trench cutoff, trench bottom treatment, slurry mixing, backfill composition, and construction procedures are discussed. At sites with excessively deep alluvium, the cutoff may be extended economically by combing the slurry trench with a grouted cutoff. A brief comparison of cutoffs for 10 dams in the U S, Canada, West Pakistan, and Surinam is given, and design and construction of the slurry trench cutoff for Wanapum Dam in Washington are cited.

R202500 67A

Jones, Jack C
DEEP CUTOFFS IN PERVIOUS ALLUVIUM, COMBINING SLURRY TRENCHES AND GROUTING Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 31, pp 509-523, Sept 1967. Harza Engg Co, Chicago, Ill, 15 p, 2 fig, 1 tab
DESCRIPTORS-- *cutoff trenches/ earth dams/ fills/ alluvial deposits/ dam design/ *dam foundations/ bentonites/ *slurries/ construction/ excavation/ backfills/ foreign projects/ grouting/ costs/ grout curtains/ cutoffs
IDENTIFIERS-- Wanapum Dam, Wash

R202501 67A BEDROCK STABILITY AT PLACE MOULIN DAM

Place Moulin Dam in Italy is a 155-m-high, double-curvature, arch-gravity dam. Geology of the damsite and safety of rock-supported concrete abutments, with emphasis on variations of foundation rock properties with time, are discussed. Structural model tests of the dam and foundation rock verified the stability of the rock abutments. Grouting procedures for waterproofing the bedrock are covered briefly. Static tests were performed to measure rock deformations produced by hydrostatic pressure test chambers in galleries located in the dam abutments; supplementary jacking tests were conducted also. Seismic tests were made to obtain dynamic elasticity modulus values along the dam foundation, and supplementary measurements were accomplished with ultrasonic core tests. A permanent instrumentation system was installed in galleries in the dam abutments and foundation for measuring changes in displacements and pressures with time.

R202501 67A

Oberti, G and Rebaudi, A
BEDROCK STABILITY BEHAVIOR WITH TIME AT THE PLACE MOULIN ARCH-GRAVITY DAM
Paper, Trans, 9th Intl Cong on Large Dams, Istanbul, Turkey, Vol 1, Ques 32, R 52, pp 849-872, Sept 1967. Polytech Inst, Turin, Italy; ENEL, Venice, Italy, 24 p, 15 fig, 1 tab
DESCRIPTORS-- bedrocks/ *rock foundations/ *dam foundations/ arch dams/ abutments/ safety/ geologic investigations/ engineering geology/ foreign design practices/ grouting/ static tests/ hydrostatic pressures/ elasticity modulus/ foreign projects/ seismic investigations/ deformation/ concrete dams/ instrumentation/ rock mechanics/ *foundation investigations
IDENTIFIERS-- in situ tests/ pressure chamber test/ rock properties/ Italy/ Place Moulin Dam, Italy

R202525 67A SETTLEMENT OF LOESS FOUNDATIONS

Field tests were conducted to determine settlement of loess foundations under low loads caused by hydraulic structures of irrigation systems. The natural settlement was measured in a 45- x 50-m pit. A pyramid-shaped earth embankment, 6 m high with a 27- x 30-m base, was located in the center of the pit. The pit was filled with water to a depth of 1 m and settlement measurements were taken on the unloaded area of the pit and under the embankment. Duration of wetting was 110 days; settling occurred for 370 days. The base of the embankment settled 207 cm in 1 year; settlement decreased with depth. The bottom of the pit settled 183 cm under zero load, while the top layer of the soil, 5 m deep, shifted with the soil surface without consolidation. Measured bottom settlements caused by soil weight were in agreement with those calculated from volume strains obtained in the triaxial test and exceeded those calculated from consolidation tests by 16%. Method and formulas for computing settlement are given and results compared with measured settlement.

R202525 67A

Pilyugin, A I
SETTLEMENT OF LOESS FOUNDATIONS UNDER CANAL EMBANKMENTS
Proc, 3rd Asian Regional Conf on Soil Mech & Fdn Engg, Vol 1, Div 1-7, pp 29-32, Haifa, Israel, Sept 1967. VODGEO Inst of State Bldg Committee of USSR, Moscow, 4 p, 5 fig, 1 tab, 3 ref
DESCRIPTORS-- *loess/ *settlement/ *foundations/ *canal embankments/ embankments/ loads/ loading time/ field tests/ consolidation/ measurement/ land subsidence/ pits/ ponding tests/ soil consolidation tests
IDENTIFIERS-- USSR/ foreign research/ triaxial tests/ wetting

FOUNDATIONS

R202526 67A FOUNDATION PROBLEMS IN LOESS SOILS

Vast areas of eastern Europe and southern and central Asia are covered with fine-grained sedimentary soil known as loess; in depth, it often exceeds 50 m. All loess-type soils are characteristically subject to considerable additional settlement on increase in water content, thereby giving rise to numerous foundation problems in all types of structural design and irrigation systems. Laboratory and field investigations on the relationship between specific additional settlement and soil parameters are described; e.g., mineralogical composition, grain-size distribution, porosity, moisture content, and degree of saturation. Recommendations for foundation design and construction are made, and effective means for improving mechanical and physical properties of loess and eliminating its sensitivity to wetting are discussed.

R202526 67A

Lehr, H
FOUNDATION ENGINEERING PROBLEMS IN LOESS SOILS
Proc, 3rd Asian Regional Conf on Soil Mech & Fdn Engg, Vol 1, Div 1-7, pp 20-24, Haifa, Israel, Sept 1967. Inst of Construction, Bucharest, Rumania, 5 p, 5 fig, 2 tab, 3 ref
DESCRIPTORS-- *loess/ *settlement/ *foundations/ *foundation failures/ soil compaction/ models/ porosity/ piles/ structural behavior/ moisture content/ compaction/ field tests/ laboratory tests/ soil physical properties/ grain sizes/ saturation/ land subsidence
IDENTIFIERS-- wetting/ Europe/ Asia

GEOLOGY AND GEOPHYSICS

R202511X67A ARID REGION ALLUVIAL FANS

Processes acting on alluvial fans and the features produced by these processes were studied in the field and laboratory. The field study involved geomorphic mapping; measurement of channel cross sections; and observations of weathering phenomena, debris size, and lithology. In the laboratory, small alluvial fans were built of mud and sand. This study focused attention on aspects of fan morphology that might otherwise have been overlooked or misidentified in the field. Material was transported to fans by debris flow or waterflow along a main channel. The channel was generally incised at the fan head but emerged onto the surface at a point about midway down the fan. On laboratory fans, most deposition above this point is by debris flow; fluvial deposition dominates below the point. On fans deficient in fine materials, large discharges may completely infiltrate the fan and deposit coarse debris as sieve deposits. Criteria for recognizing and distinguishing debris flow deposits and sieve deposits are given. Has 23 references.

R202511X67A

Hooke, Robert L
PROCESSES ON ARID-REGION ALLUVIAL FANS
Jour of Geol, Vol 75, No 4, pp 438-460, July 1967. U of Minnesota, Minneapolis, 25 p, 10 fig, 5 tab, 2 plate, 23 ref, append
DESCRIPTORS-- *alluvial deposits/ *geologic investigations/ particle size/ *geology/ *geomorphology/ deposition/ *arid land/ stream channels/ deserts/ weathering/ slopes/ sieve analysis/ *sediment transport/ hydraulic models/ channeling/ bibliographies/ fans/ sedimentation
IDENTIFIERS-- debris/ alluvial channels

R202512X67A ORIGIN OF THE PIEDMONT ANGLE

The piedmont angle, an abrupt rise in slope from plains to residual uplands, is an important geomorphic feature commonly observed in arid and semiarid lands. There is no general agreement on the evolution of the piedmont angle. Three hypotheses illustrating certain problems are reviewed, and field observations made in South Australia are presented. Some important aspects of the piedmont angle are: the piedmont angle is formed at the junction of consistently precipitous escarpments and flat plains, significant detrital accumulations rarely are present at the base of the hill slope, alluvial fans are poorly developed, and bedrock beneath the plains frequently is covered by a mantle of debris. The piedmont angle is principally of structural origin. The sharp break in slope is found at lithologic or structural boundaries but rarely is developed at fault zones. Any explanation of the piedmont angle must consider weathering and erosion of the bedrock. Resistant cappings and intense topographically controlled differential weathering and erosion, important in slope development, are not confined to desert regions. Although best and most generally developed in desert areas, pediments and the piedmont angle may develop in other climatic regions where structural conditions are favorable. Has 27 references.

R202512X67A

Twidale, C R
ORIGIN OF THE PIEDMONT ANGLE AS EVIDENCED IN SOUTH AUSTRALIA
Jour of Geol, Vol 75, No 4, pp 393-411, July 1967. U of Adelaide, Australia, 21 p, 10 fig, 2 plate, 27 ref
DESCRIPTORS-- *geology/ *geologic investigations/ geologic formations/ deserts/ *geomorphology/ slopes/ weathering/ erosion/ aggradation/ arid land/ semiarid land/ *topography/ *land forms/ alluvial deposits/ bedrocks/ bibliographies/ detritus
IDENTIFIERS-- pediments/ *piedmont/ structural geology/ Australia

R202522 66A ENGINEERING SEISMOLOGY

Although there is no known way of forecasting exact location, size, or time of an earthquake, a safe assumption for probabilistic predictions can be made on the basis that past patterns of seismic activity will continue. Estimation of the design earthquake and its effects are discussed. Site selection for a structure and prediction of site behavior during an earthquake are problems requiring the joint efforts of the engineer, geologist, and engineering seismologist. Techniques for developing data necessary to predict site behavior in an earthquake are explained; these techniques include borings, geology, seismographs, strong motion accelerographs, refraction seismographs, uphole seismic surveys, microtremor surveys, forced vibration studies, amplification spectra, ground motion spectra, and estimation of the design earthquake. The paper concludes with a section on industrial vibrations. Engineering seismologists assist in solving problems involving the hazards of natural and man-made ground motion by providing the basis for aseismic design, defining vibration movement, and recommending ways to reduce damages from these hazards. Has 37 references.

R202522 66A

Leeds, David J
ENGINEERING SEISMOLOGY IN SOUTHERN CALIFORNIA
Engineering Geology in Southern California, Assn of Engg Geologists, pp 35-53, Glendale, Calif, Oct 1966. Dames & Moore, Los Angeles, Calif, 19 p, 8 fig, 37 ref
DESCRIPTORS-- *seismology/ geophysics/ engineering geology/ seismic waves/ *seismic investigations/ seismic properties/ bibliographies/ seismographs/ vibrations/ earth movements/ *earthquakes/ *seismic design
IDENTIFIERS-- ground particle velocity/ earthquake-resistant struct/ site selection/ *earthquake engineering/ earthquake damage/ earthquake loads/ southern California

R202523 67A MICROTREMORS AND LANDSLIDES

Microtremor records show a close relationship between the shape of the period-distribution curve and characteristics of the subsoil. As the period-distribution curve is related to site characteristics, determining ground structure from the dominant period of microtremors should be possible; however, no adequate explanation is available based on wave theory. The quarter wavelength law, developed for explosion-generated surface waves, gives a relation of the dominant period to thickness of the ground layer and longitudinal wave velocity. As microtremors resemble surface waves, the author attempts to determine ground structure by applying the quarter wavelength law to the dominant period of microtremors. Field studies were conducted to determine suitability of the quarter wavelength law and to investigate ground structure in landslide areas. Results show the method permits determination of subsoil structure. The possibility of predicting landslide danger areas is also mentioned.

R202523 67A

Tamaki, I
THE DOMINANT PERIOD OF MICROTREMORS AND ITS APPLICATION TO THE INVESTIGATION OF LANDSLIDES. Proc, 3rd Asian Regional Conf on Soil Mech & Fdn Engg, Vol 1, Div 1-7, pp 353-357, Haifa, Israel, Sept 1967. Osaka Inst of Tech, Japan, 5 p, 8 fig, 1 tab, 7 ref
DESCRIPTORS-- vibrations/ *seismic investigations/ seismic waves/ subsoil/ seismic properties/ seismographs/ *subsurface investigations/ longitudinal waves/ *geophysics/ *engineering geology/ geologic investigations/ wave velocity/ bedrocks/ earthquakes/ seismology/ *landslides
IDENTIFIERS-- *microseisms/ slip planes/ slope stability/ structural geology

R202555 67A GEOPHYSICS AT STRAIGHT CREEK TUNNEL

Seismic and electrical resistivity measurements were made in the Straight Creek tunnel pilot bore during and immediately after construction. These measurements were interpreted to obtain seismic velocity and electrical resistivity of rock behind the disturbed rock surrounding the pilot bore. Velocity and electrical resistivity were found to have quite good correlation with time rate of construction, construction cost per foot, rock quality, set spacing, percentage lagging and blocking, type of steel support required, height of tension arch, and vertical load. Results indicate that predictions of engineering and economic parameters could be made for a new tunnel if correlations such as these could be established either during the initial stages of construction or from previous measurements of another similar tunnel constructed in similar rock. Additional seismic and resistivity surveys were made on the surface and in holes drilled from the surface over the line of the pilot bore. Reasonably accurate predictions are possible from surface measurements and would be useful for selecting a site if several alternative routes were under consideration. With an established predictive capability, tunneling efficiency can be improved and costly pilot bore construction probably could be eliminated.

R202555 67A

Scott, James H and Carroll, Roderick D
SURFACE AND UNDERGROUND GEOPHYSICAL STUDIES AT STRAIGHT CREEK TUNNEL SITE, COLORADO. Hwy Res Record, No 185, pp 20-35, 1967. USGS, Denver, Colo, 16 p, 10 fig, 3 tab, 8 ref
DESCRIPTORS-- *tunnel construction/ tunnel pressures/ tunneling/ *seismic investigations/ *geophysics/ engineering geology/ costs/ boreholes/ seismic waves/ *subsurface investigations/ reconnaissance surveys/ arch/ geologic investigations/ *electrical resistivity/ correlation techniques/ tunnels/ wave velocity
IDENTIFIERS-- rock properties/ tunnel supports/ electric logging/ *seismic refraction/ seismic velocity/ Straight Creek tunnel, Colo/ correlation

R202484X67A TURBULENT BOUNDARY LAYER

The author presents his impression of current knowledge on turbulent boundary layer flow. Prediction procedures are discussed, the most promising procedure is selected, and actions to be taken before the procedure will provide adequate predictions for the whole range of 2-dimensional flows are indicated. Boundary layer theories are classified as either explicit integral or effective viscosity theories. Explicit integral theories employ extensive empirical information on integral quantities such as drag coefficient and momentum thickness, and these explicitly express the auxiliary quantities appearing in differential equations. Effective viscosity theories are built upon partial differential equations and take their empirical input in the form of expressions for the effective viscosity. The effective viscosity approach is recommended as it offers a unified theory usable for all boundary layer phenomena. The Kolmogorov-Prandtl model appears to be the most promising of the various effective viscosity theories. Mathematical methods for solving partial differential equations are reviewed, and the author recommends marching integration procedures. Several outstanding problems are given, and the path for future research is discussed. Has 40 references.

R202484X67A

Spalding, D B
THEORIES OF THE TURBULENT BOUNDARY LAYER
Applied Mech Rev, Vol 20, No 8, pp 735-740, Aug 1967. U of London, G B, 6 p, 2 fig, 40 ref
DESCRIPTORS-- hydraulics/ fluid flow/ fluid mechanics/ digital computers/ *turbulent flow/ *boundary layer/ bibliographies/ mathematics/ integration/ mathematical analysis/ computation/ viscosity/ differential equations/ two-dimensional/ classifications/ reviews
IDENTIFIERS-- mathematical models/ foreign research/ Great Britain

R202509 67A TURBULENT FLOW IN SUDDEN ENLARGEMENTS

Methods defining the spread of turbulent flow discharging from hydraulic structures are described. The required area of protection against erosion is determined by calculating the location of the point of intersection of the spreading flow with the channel banks. Protection should extend to this point. The angle of spread is related to the Froude number of the flow and the relative width of the downstream channel (ratio of structure width to downstream channel width). Experimental data are compared with results of 2 theoretical investigations.

R202509 67A

Lilitskii, G A
SECTION OF FULL SPREAD OF TURBULENT FLOW WITH A SUDDEN ENLARGEMENT IN THE CHANNEL. Gidravlika i gidrotekhnika, No 3, pp 93-97, 1967. Transl from Russ, USBR Transl 722, Aug 1967, 9 p, 2 fig, 6 ref
DESCRIPTORS-- foreign design practices/ hydraulics/ Froude number/ *sudden enlargements/ open channels/ fluid flow/ model tests/ outflows/ *outlets/ calculations/ *energy dissipation/ eddies/ velocity/ small structures/ measurement/ scour/ erosion control/ *bank protection/ *turbulent flow/ hydraulic models/ *open channel flow
IDENTIFIERS-- USSR/ *flow patterns/ flow distribution/ flow characteristics

R202549 67A RADIOISOTOPES MEASURE PIPELINE DISCHARGE

Use of radioisotopes to measure waterflow is a part of the Bureau of Reclamation's program to improve water measurement practices. Measurements were made in the Salt River Project irrigation system in concrete pipelines 2, 2.5, and 3.5 ft in dia. A pitot velocity method was used to measure the discharge for comparison with the discharge measured by the sudden injection or total count radioisotope method. The sample tank and infinite medium techniques were used for counting the radioisotope activity. Accuracy of the radioisotope measurement method could not be evaluated extensively because of the limited number of tests. Although relatively good repeatability was shown in measuring a given discharge by the radioisotope method, discharges computed by the 2 methods differed by -7.3 to -15.7%.

R202549 67A

Schuster, Jack C
PIPELINE DISCHARGE MEASUREMENTS WITH RADIOISOTOPES
USBR Lab Rept Hyd-578, Hyd Br, Sept 1967. Bureau of Reclamation, Denver, Colo, 24 p, 8 fig, 5 tab, 1 ref
DESCRIPTORS-- *discharge measurement/ *radioactive isotopes/ tracers/ field tests/ mixing/ pipes/ *radiation measurement/ velocity/ geiger counters/ *test procedures/ pitot tubes/ concrete pipes/ pipelines/ injection/ water measurement
IDENTIFIERS-- mixing length/ irrigation water/ Salt River Project, Ariz/ scintillation counters/ *total count method/ gold isotopes/ accuracy/ sudden injection method

R202550 67A SURGE WAVE ATTENUATION BY A SIDE WEIR

Theoretical equations and supporting experimental data are presented for determining attenuation of surge waves by a longitudinal side weir in a trapezoidal channel. Comparisons are made of a theoretical equation derived previously for rectangular channels and an equation developed during the study; agreement of the equations with experimental data is determined. Surge heights were recorded by 6 capacitance-type wave probes with sensors consisting of plasticized-enamel-coated wire. Two short digital computer programs were developed for trial solutions of the theoretical equations. An explanation of each program, source statement listing, sample input data, and results are presented in an appendix.

R202550 67A

Rungrongtaanin, S and King, D L
ATTENUATION OF SURGE WAVES BY A SIDE WEIR IN A TRAPEZOIDAL CHANNEL
USBR Lab Rept Hyd-575, Hyd Br, Apr 1967. Bureau of Reclamation, Denver, Colo, 44 p, 14 fig, 5 tab, 13 ref, append
DESCRIPTORS-- canals/ model tests/ *surges/ *trapezoidal channels/ weirs/ hydraulic transients// bore /wave// Froude number/ translatory waves/ unsteady flow/ calibrations/ instrumentation/ measuring instruments/ recording systems/ capacitance/ dielectrics/ electronic equipment/ research and development/ oscillographs/ computer programming/ mathematical analysis/ hydraulic models/ hydraulics/ *open channel flow
IDENTIFIERS-- Citrini equation/ wave probes/ wave attenuation

R202533 67A FLOOD FORECASTING METHODS COMPARED

Knowledge of small basin floods and state-of-the-art of flood predictions on ungaged basins are such that engineering judgment still plays an important role in determining a design flood. An appraisal of the reliability of 5 current methods of flood prediction is presented. The first phase involved a comparison among flood estimates obtained by applying rainstorms estimated to have return periods of from 2 to 200 yr. For each of 6 such levels of protection applied to 14 real basins, inconsistencies among 5 methods produced differences in the magnitude of their estimates as great as 300%. Because long flood records for small basins were inadequate, observed rainfalls were applied to formulas and design methods for a second phase of the study. Design estimates based on recorded rainstorms were compared to 134 observed floods. These events occurred on 45 mixed-cover agricultural basins ranging in size from 0.12 to 8.16 sq mi, within 13 states of the U S. Scatter-diagrams, histograms, and statistics suggest some superiority of the Rational formula, Bureau of Public Roads method, and Tacitly Maximized Peak technique in that they generally overestimate floods from this study. Although their variability is also less than that of the other 2 methods, underprediction occurs in about one-third of the cases. Has 25 references.

R202533 67A

Hiemstra, Lourens A V and Reich, Brian M
ENGINEERING JUDGMENT AND SMALL AREA FLOOD PEAKS
Hydrology Paper 19, Colorado State U, Fort Collins, Apr 1967. 29 p, 11 fig, 9 tab, 25 ref, append
DESCRIPTORS-- *flood/ *flood forecasting/ *flood peaks/ river basins/ *design flood/ watersheds/ bibliographies/ rainfall/ probability/ small projects/ hydrologic data/ hydrology/ hydrographs/ rainfall intensity
IDENTIFIERS-- evaluation/ Rational formula/ comparative studies/ small watersheds

R202534 67A ACCURACY OF DISCHARGE DETERMINATIONS

The objective of this study was to analyze errors that may occur in discharge determinations made on mountain streams. Possible sources of error were considered and a classification of the sources, including notations on the nature of the resulting errors, was prepared. Methodology is given for evaluation of daily, monthly, and annual discharge estimates. An exhaustive literature review was undertaken regarding qualitative and quantitative aspects of the topic. The material was sorted in an attempt to divide the total error in a discharge determination into various component errors. Each component was analyzed to yield information about the random or systematic nature of the error and possible functional relationships; information is summarized in the form of a classification of errors. A hypothetical error model was developed for a single discharge measurement. Expected value and variance of the model were studied so that inferences could be made regarding the significant error terms. Consideration was given to the error arising from use of an estimated rating curve. A mathematical representation was given to the stage-discharge relationship and found to account for virtually all the variability in sample data for 9 mountain stream-gaging stations in Colorado. Lists 122 references.

R202534 67A

Dickinson, W T
ACCURACY OF DISCHARGE DETERMINATIONS
Hydrology Paper 20, Colorado State U, Fort Collins, June 1967. U of Guelph, Canada, 54 p, 11 fig, 17 tab, 122 ref
DESCRIPTORS-- *discharge measurement/ *streamflow/ stream gages/ pulsating flow/ mathematical analysis/ errors/ bibliographies/ hydrology/ correlation techniques/ current meters/ velocity/ discharge coefficients/ statistical analysis/ streams/ hydrometeorological station/ mountains/ velocity distribution
IDENTIFIERS-- *accuracy/ evaluation/ mathematical models/ stream gaging station/ streamflow simulator models

R202535 67A LINEAR ROUTING IN UNIFORM OPEN CHANNELS

A general linear solution to the flood routing problem is obtained by solving a linearized equation of motion for a semi-infinite uniform open channel subject to a delta-function inflow at the upstream end. This solution is used to compare the accuracy of the more important special linear procedures used in applied hydrology for flood routing. The effect of varying the reference discharge, used as the basis of the linearization, is examined.

R202535 67A

Dooge, J C I and Harley, B M
LINEAR ROUTING IN UNIFORM OPEN CHANNELS
Proc, Intl Hydrol Symp, Vol 1, pp 57-63, Fort Collins, Colo, Sept 1967.
University College, Cork, G B, 7 p, 4 fig, 7 ref
DESCRIPTORS-- *flood routing/ *open channels/ open channel flow/ hydrology/ outflows/ linear systems/ Froude number/ *hydrographs/ *flood hydrographs/ mathematical analysis/ discharges/ foreign design practices/ flood forecasting
IDENTIFIERS-- inflow/ Muskingum method/ Ireland

R202536 67A THRESHOLD FACTORS IN HYDROLOGIC SYSTEMS

Total water storage volume of a catchment can be visualized as being replaced by a uniform storage layer covering the whole catchment, with storage characteristics being an average of the catchment. For uniform precipitation conditions in this model catchment, threshold concepts approximately are valid. Rainfall relations being valid at all possible precipitation conditions which may be derived by way of new structured coaxial rainfall-runoff relations generally deviate from the model catchment relations. These deviations are a measure of the hydrological inhomogeneity of the considered natural catchments.

R202536 67A

Becker, Alfred
THRESHOLD CONSIDERATIONS AND THEIR GENERAL IMPORTANCE FOR HYDROLOGIC SYSTEMS INVESTIGATION. Proc, Intl Hydrol Symp, Vol 1, pp 94-102, Fort Collins, Colo, Sept 1967. Inst fur Wasserwirtschaft, Berlin, E Germany, 9 p, 4 fig, 2 ref
DESCRIPTORS-- hydrology/ reservoirs/ *water storage/ *runoff/ watersheds/ ground water/ *surface runoff/ *rainfall/ atmospheric precipitation/ soil moisture/ models/ groundwater recharge/ aquifers/ storms
IDENTIFIERS-- *catchments/ mathematical models/ East Germany

R202538 67A RELIABILITY OF RESERVOIR OPERATION

Probabilistic estimates of the reliability of storage reservoir operation may be made using 3 different bases for certainty: probability of a nonfailure year, duration time of all the nonfailure intervals, and quantity of water supplied to a consumer. For an unlimited period of time, certainty can be represented by a single value; however, for a finite time period there is a continuous distribution of certainty values. A method for determining the distribution of certainty values for any of the 3 types of certainty for a reservoir with seasonal input is presented. The method employs Moran's discrete approximation to a continuous distribution and Gould's method for determination of transition probabilities.

R202538 67A

Klemes, Vit
RELIABILITY ESTIMATES FOR A STORAGE RESERVOIR WITH SEASONAL INPUT
Proc, Intl Hydrol Symp, Vol 1, pp 414-421, Fort Collins, Colo, Sept 1967.
Slovak Acad of Sci, Bratislava, Czechoslovakia, 8 p, 1 fig, 4 ref
DESCRIPTORS-- *probability/ *reservoir operation/ water management/ *water storage/ mathematical analysis/ distribution/ reservoirs/ reservoir yield/ hydrology/ project planning/ water yield/ *reliability/ storage
IDENTIFIERS-- *reservoir storage/ Czechoslovakia/ foreign research/ seasonal variations

R202539 67A FLOOD PEAK PREDICTION

Flood peak prediction methods are analyzed for performance in making estimates on small, ungaged, rural drainage basins. Five methods were used to predict individual floods on the basis of concurrently observed rainfall. Predictions made by the 5 methods are compared for 134 floods on 45 streams at 19 locations widely spaced across the U S. The methods were purposely tested in arid and nonarid regions and beyond the geologic zones for which they were developed in order to search for generality and adaptability. Scatter in predicted values is discussed in view of requirements and restrictions imposed by the developers of the various techniques. Diagrams and statistics illustrate the uncertainties involved and show which methods underpredict or overpredict this sample from nature.

R202539 67A

Reich, Brian M and Hiemstra, Lourens A V
PURPOSE AND PERFORMANCE OF PEAK PREDICTIONS
Proc, Intl Hydrol Symp, Vol 1, pp 565-572, Fort Collins, Colo, Sept 1967.
Pennsylvania State U, University Park; Colorado State U, Fort Collins, 8 p, 5 fig, 2 tab, 8 ref
DESCRIPTORS-- flood/ *flood forecasting/ flood hydrographs/ *flood peaks/ hydrology/ drainage basins/ estimating/ statistics/ *design flood/ rainfall intensity/ design tools/ rainfall/ runoff/ hydrographs/ watersheds/ runoff coefficients
IDENTIFIERS-- *flood estimate

HYDROLOGY

R202558 67A LABORATORY STUDY OF WATERSHED HYDROLOGY

A conventional approach to study the rainfall-runoff relationship of a watershed uses historical hydrologic data to fit a black-box model for simulation of watershed hydrologic behavior. Although many measurements of rainfall input and runoff output from watersheds are available, no general theory explaining the course of flow mechanics from input to output exists. The proposed laboratory approach investigates basic laws and principles controlling mechanics of runoff from a watershed. It employs a watershed experimentation system (WES) as a tool for the research. The WES is an instrumentation system of integrated hydraulic, electronic, and structural design that can produce an artificial rainfall of variable time and space distribution to move over a laboratory area of 40 by 40 ft or less; thus, it is capable of simulating a storm moving in any direction over a testing drainage basin constructed within the area. The experiment is controlled electronically by a digital computer, and output runoff is measured by sonar detectors which transmit information to the computer for immediate recording and analysis. Various problems being studied include the time factor in runoff process, conceptual watershed roughness, and effect of storm movement on peak discharges. The WES also may be used to study subsurface runoff by employing testing basins made of porous materials.

R202558 67A

Chow, Ven Te
LABORATORY STUDY OF WATERSHED HYDROLOGY
Paper, Intl Hydrol Symp, Fort Collins, Colo, Sept 1967. U of Illinois, Urbana, 14 p, 3 fig, 7 ref
DESCRIPTORS-- *watersheds/ rainfall/ runoff/ hydraulic models/ hydrology/ hydrologic data/ storms/ simulation/ computer programming/ surface runoff/ models/ *drainage basins/ flow/ artificial precipitation/ laboratory equipment/ laboratory tests
IDENTIFIERS-- watershed experiment system/ rainfall simulators/ *rainfall-runoff relation/ raindrop splash/ urban hydrology/ black box analysis

IRRIGATION

R202529X67A SPRINKLER SYSTEM PROJECTS

A project-type sprinkler system comprises a central pressure-producing device and high-pressure mains radiating to farm delivery locations. The minimum cost distribution system will deliver just enough water to meet peak demands with sprinklers operating almost continuously. An equation is developed to determine cost differential between this minimum capacity system and one using large pipe to allow part-time sprinkling. A method for economic sizing of pipe in a gravity system is developed and its use illustrated; an economic sizing method for pump discharge lines with lateral turnouts is developed also. Use of graduated-size pumps is recommended to provide greatest flexibility in operation with a reasonable number of units. Fluctuation of operating pressures at farm delivery, caused by changing demand during the irrigation season, remains a problem in the use of these systems.

R202529X67A

Mandry, James E
DESIGN OF PIPE DISTRIBUTION SYSTEMS FOR SPRINKLER PROJECTS
ASCE Proc, Jour Irrig & Drng, Vol 93, No IR3, Paper 5454, pp 243-257, Sept 1967. Bureau of Reclamation, Denver, Colo, 15 p, 6 fig, 2 tab, 3 ref, append
DESCRIPTORS-- *sprinkler irrigation/ projects/ irrigation systems/ design/ pipelines/ automatic control/ *distribution systems/ pumping plants/ costs/ hydraulic gates and valves/ optimum design/ hydraulic gradients/ sizes/ water hammer/ fluid friction/ economics
IDENTIFIERS-- formulas/ layout/ pressure control mechanism/ discharge lines

R202537 67A ESTIMATING IRRIGATION WATER REQUIREMENTS

IRRIGATION

The Bureau of Reclamation currently is studying better procedures for estimating various factors comprising the total irrigation water requirement: crop consumptive use, effective precipitation, distribution losses, surface runoff, and deep percolation. Preliminary data show that the most common cause of lower-than-optimum irrigation efficiency is lack of sufficient information on the part of the irrigator about the optimum time to apply water and the quantity to be used. To illustrate the importance of farm efficiencies on the project water requirement, a change from 50 to 60% farm irrigation efficiency on a project would result in a 17% reduction in water requirement for the area or a 20% increase in the area which could be served, assuming the reservoir and conveyance efficiencies remained constant. This example represents the extreme case, since it does not take into account any downstream reuse of return flow; nevertheless, it points out that improved efficiency of the use of present water supplies in some areas may be more attractive in terms of both costs and benefits than the development of new supplies. Relative importance of the various factors is discussed and revised procedures for estimating them are presented.

R202537 67A

Robb, David C N
PROCEDURES FOR ESTIMATING IRRIGATION WATER REQUIREMENTS
Proc, Intl Hydrol Symp, Vol 1, pp 141-148, Fort Collins, Colo, Sept 1967. Bureau of Reclamation, Denver, Colo, 8 p, 2 fig, 1 tab, 4 ref, append
DESCRIPTORS-- irrigation/ *water requirements/ forecasting/ percolation// consumptive use /water// evapotranspiration/ surface runoff/ estimating/ *irrigation efficiencies/ seepage losses/ irrigation practices/ benefits// demand /irrigation systems// distribution systems/ costs/ irrigation O&M/ agriculture
IDENTIFIERS-- Bureau of Reclamation/ water use

R202548X67A COMPUTER CONTROLLED AUTOMATIC TESTING

MATHEMATICS

The digital computer has assumed a very active and powerful role in controlling automatic test equipment. It has become a vital component of the test system because of its inherent abilities for high-speed calculation, large-capacity memory, and programmed decision making--abilities that enable the test system to isolate faults to a level normally attainable only by skilled test personnel. The computer provides the test designer with a flexibility that eases the planning of test procedures and reduces the size of the total test program. It readily accommodates mathematical diagnostic techniques as they are perfected and opens the door to simplifications in the stimulus and measurement equipment that it controls. The philosophy of computer-controlled automatic testing is reviewed, and specific cases of the powerful role played by the computer are presented.

R202548X67A

Joyce, B T and Stockton, E M
COMPUTER CONTROLLED AUTOMATIC TESTING
Software Age, Vol 1, No 1, pp 18-26, Sept 1967. Radio Corp of America, Burlington, Mass, 6 p, 9 fig, 2 ref
DESCRIPTORS-- *automatic control/ *control systems/ *test procedures/ data processing systems/ computer programming/ digital computers/ measurement/ analog computers/ digital-to-analog converter/ digital systems/ operations research/ mathematical analysis/ laboratory tests/ technology/ logic/ reviews/ measuring instruments/ scientific method
IDENTIFIERS-- testing equipment/ application techniques/ diagnostic routines

MATERIALS ENGINEERING

R202502X67A CORROSION IN STEEL WATER MAINS

If an adequate corrosion control system for a steel water main is to be designed and installed at minimum expense, the corrosion engineer should be authorized to conduct a complete corrosion survey prior to the start of construction so that the most favorable corrosion control design can be incorporated into the system as it is constructed. To prevent external galvanic corrosion, a combination of coating and cathodic protection has gained wide acceptance as the best solution. When internal protection is needed because chemical analysis shows the water to be aggressive to steel, corrosion usually can be controlled by applying an internal coating system using a cement lining or standard coal-tar enamel coating. One hundred percent corrosion control can be achieved by providing internal cathodic protection using a zinc strip anode. Principles of corrosion and various methods of control are described.

R202502X67A

Peabody, A W
CORROSION IN STEEL WATER MAINS
AWWA Jour, Vol 59, No 8, pp 993-1002, Aug 1967. Ebasco Services, Inc, N Y, N Y, 10 p, 11 fig
DESCRIPTORS-- *corrosion/ *steel pipes/ *water pipes/ *corrosion control/ pipelines/ *cathodic protection/ electrical conductance/ electric currents/ electric insulation/ fittings/ anodes/ cathodes/ railroads/ electrical grounding/ tramways/ electrolysis/ protective coatings/ cinders/ costs
IDENTIFIERS-- galvanic corrosion/ electrochemical corrosion/ stray current corrosion/ rectifier ground-bed method/ *corrosion currents/ galvanic protection systems/ underground corrosion/ buried metalwork/ insulation// surveys /data collection/

MECHANICAL ENGINEERING

R202532 67A USSR FRANCIS TURBINE MODEL TESTS

Investigating models of Francis turbine runners in a USSR hydraulic machine laboratory showed the causes for formation of vortical turbulence behind the runner, leading to increased cavitation and vibration of the unit. Five models of runners having a constant draft tube height with a greater-than-critical cavitation coefficient were compared by visual observation, velocity measurements, linear measurements of vortical flow diameter parallel to and 100 mm from the lower plane of the band, and ratio of the diameter of vortical disturbance to the diameter of the draft tube entrance. Results of flow torsion measurements at the runner exit were compared with calculated data obtained by computing the effect of the distributor. Conclusions were: (1) Vortical turbulence behind the runner is caused by flow torsion at the runner outlet. (2) During runner design calculations, flow torsion at the runner exit should be considered, taking into account the unevenness of flow torsion created by the distributor. (3) For Francis turbines with a specific speed of 200, flow torsion can be defined satisfactorily and meridional projection of the blades chosen so that hub velocity equals zero or is slightly negative.

R202532 67A

Kliuikov, N T
SOME RESULTS OF MODEL TESTS ON FRANCIS HYDRAULIC TURBINES
Energomashinostroenie, No 4, pp 35-37, 1963. Transl from Russ, USBR Transl 708, Aug 1967, 16 p, 5 fig, 1 tab, 5 ref, append
DESCRIPTORS-- *Francis turbines/ *model tests/ turbine parts/ *vortices/ turbine runners/ turbine blades/ foreign design practices/ draft tubes/ velocity distribution/ *turbulence/ fluid flow/ fluid mechanics/ guide vanes/ *cavitation/ efficiencies/ torsion/ *hydraulic machinery/ vibrations/ hydraulic turbines
IDENTIFIERS-- USSR/ foreign research/ machine design/ optimum performance/ comparative studies

R202545 67A HYDRAULIC RESONANCE--POWERPLANT CONDUITS

MECHANICAL ENGINEERING

Field tests of hydraulic resonance in pressure conduits for hydroelectric powerplants in the USSR pointed to the need for further field and laboratory investigations. Powerplants with operating Francis, Kaplan, and twin-blade Kaplan turbines were examined for: (1) vibrations behind the runner, causing pressure surges in draft tubes or penstocks and (2) frequency, harmonics, and amplitudes of the vibrations leading to hydraulic resonance. Francis turbines were tested at partial loads and heads with 30 to 85% distributor openings. Kaplan turbines were tested during various operating conditions, including motoring. These tests showed that during turbine operation, hydraulic resonance may occur at frequencies of 0.3 to 200 hz, inducing intense pressure surges and vibrations in the unit and pressure conduits and thus reducing service life of and sometimes causing damage to the equipment. Hydraulic resonance frequency is determined by pressure conduit parameters and nature of the flow disturbance. During design, a check computation should be made using design dimensions that preclude resonance at frequencies occurring during turbine operation. Resonance in the throat ring is particularly dangerous because of the interaction with the mechanical resonance of the blades at one of their natural frequencies.

R202545 67A

Shramkov, K A
HYDRAULIC RESONANCE IN THE CONDUITS OF HYDROELECTRIC POWERPLANTS
Gidrotek Stroitel'stvo, No 2, pp 12-16, 1967. Transl from Russ, USBR Transl 689, Aug 1967, 23 p, 11 fig, 2 tab, 3 ref, append
DESCRIPTORS-- *penstocks/ *draft tubes/ hydroelectric powerplants/ *surges/ hydraulics/ hydraulic structures/ *resonance/ pressure pipes/ water hammer/ *pressure conduits/ vibrations/ hydraulic turbines/ frequency modulation/ turbine runners/ turbine blades/ frequency/ frequency shifts/ damages/ natural frequency
IDENTIFIERS-- USSR/ sinusoidal/ harmonics/ *hydraulic resonance

R202557 67A CONTINENTAL HYDROLOGIC DROUGHTS

METEOROLOGY AND ATMOSPHERIC WATER RESOURCES

Concepts for objective definition of hydrologic droughts are proposed and elective factors for such definition presented. These include: the phenomenon determining the drought, variables describing this phenomenon, moisture level at which a drought starts, and the area related to the drought. Three runs as statistical properties of time and space distribution of moisture are proposed to represent parameters of drought definition: (1) run-length of negative deviations (duration of drought), (2) run-sum of negative deviations between a downcross and an upcross (severity of a drought), and (3) area-run as the deficit of all moisture over a time duration (run-length) and an area of drought. Examples of these methods used to determine properties of runs are the independent standard normal and log-normal variables. Results obtained at Colorado State University in the last 4 to 5 yr on properties of precipitation, effective precipitation, and runoff affecting the description of droughts and explaining the outlook for drought prediction are reviewed. Possibilities of drought prediction and potential causal factors explaining droughts are discussed. An approach is proposed for prediction of large continental droughts by an interrelationship of oceanic synoptic situation and continental precipitation.

R202557 67A

Yevjevich, Vujica
AN OBJECTIVE APPROACH TO DEFINITIONS AND INVESTIGATIONS OF CONTINENTAL HYDROLOGIC DROUGHTS. Hydrology Paper 23, Colorado State U, Fort Collins, Aug 1967. 19 p, 9 fig, 1 tab, 12 ref
DESCRIPTORS-- *droughts/ hydrology/ atmospheric precipitation/ rainfall/ runoff/ surface runoff/ streamflow/ streamflow records/ investigations/ *climatology/ *forecasting/ weather/ statistical analysis/ *meteorology/ weather modification
IDENTIFIERS-- water transfer/ Monte Carlo method/ histograms/ insurance

R202491X67A HYDROELECTRIC RESOURCES IN BRAZIL

A survey of the hydroelectric resources in the State of Minas Gerais, Brazil, is described. An investigation was made to inventory all feasible powersites on the rivers of the 6 major basins, covering 90% of the State. The survey included 670,000 sq km of drainage area and 17,000 km of watercourse. 280 hydroelectric sites were field examined; 150 were found to qualify for inclusion in this inventory and represented a total potential of approximately 15,000 mw. Feasibility studies of 11 of the better sites suggest a total capability of over 5,600 mw. The purpose of this survey was to select good projects for inclusion in a long-range program of orderly development. Inadequacy of existing hydrometric records established a need for a suitable network of hydrometric stations to collect water data. Details of this hydro survey and methods used to obtain reasonable accuracy at minimum expense are discussed. The survey was principally concerned with hydropower but also covered irrigation, navigation, and flood control.
R202491X67A

Anonymous
THE HYDROELECTRIC RESOURCES OF MINAS GERAIS--BRAZIL
Water Pwr, Vol 19, No 7, pp 269-282, July 1967. Tech Staff of Centrais Electricas de Minas, Gerais, Brazil, 9 p, 6 fig, 2 tab
DESCRIPTORS-- project planning/ project feasibility/ foreign projects/ water resources/ streamflow records/ *hydroelectric power/ reconnaissance surveys/ hydrometeorological station/ geology/ *river basin development/ multiple purpose projects/ hydrology/ *feasibility studies/ water storage
IDENTIFIERS-- Brazil/ *hydroelectric power surveys/ economic growth/ site selection/ *hydroelectric resources

R202492X67A PLANNING OF PUMPED STORAGE PLANTS

Location and size of a pumped storage plant are determined by natural conditions, distance from the consumption center and main source of pumping energy, and specific conditions in the supply area. Basic considerations regarding the design of pumped storage plants are reviewed and discussed. They include: (1) Fundamental factors determining choice of plant location and size; (2) economic, geologic, and operational factors determining general arrangement; (3) choice of underground, partially underground, or surface-type powerhouses and penstocks; (4) location of upper reservoir, type of intake structure, and selection of penstock or pressure shaft; (5) powerhouse design (especially underground plants), depending on location of penstock valves and transformers; (6) comparison of horizontal and vertical units, or use of reversible pump turbine units; (7) design considerations of underground plants, tailwater gates, tailwater tunnels, and outlet structures; and (8) importance of the lower reservoir location and water level to the overall project. Costs of pumped storage projects are discussed, and a tabulation of statistical data for 15 pumped storage plants is included.
R202492X67A

Blind, Hans
PLANNING OF PUMPED-STORAGE PLANTS
Water Pwr, Vol 19, No 6-7, pp 226-230 & 287-292, June & July 1967. Lahmeyer-Intl, Frankfurt, W Germany, 11 p, 19 fig, 4 tab
DESCRIPTORS-- project planning/ *pumped storage/ hydroelectric powerplants/ economics/ pump turbines/ geology/ reservoirs/ *underground powerplants/ costs/ surge tanks/ penstocks/ intake structures/ hydraulic machinery/ foreign design practices/ pumps/ turbines/ backwater/ hydraulics/ outlet works/ tunnels
IDENTIFIERS-- *site selection/ West Germany/ rock properties

R202517X67A CABLE METHOD OF IN SITU ROCK TESTING

ROCK MECHANICS

When applying a load to massive rock in situ, obtaining a suitable reaction point is difficult. The problem usually is overcome by confining such tests to tunnels or slits in rock. An alternative method is to anchor cables in a borehole; further advantages are derived if 2 parallel cables are used. By this method, large forces can be applied to the rock surface directly and in any desired direction. With 2 cables, the volume of rock influenced becomes greater, and an additional jacking load parallel to the rock surface can be applied between the heads. Thus, anisotropy of rock properties can be detected, and the shear strength can be found by carrying the test to failure. The analysis, based on the Boussinesq and Cerrutti solutions, is extended to cover the case of transverse isotropy. A description of pilot field trials is included. Has 57 references.

R202517X67A

Zienkiewicz, O C and Stagg, K G
CABLE METHOD OF IN SITU ROCK TESTING
Intl Jour of Rock Mech & Min Sci, Vol 4, No 3, pp 273-300, July 1967. U of Swansea, G B, 28 p, 22 fig, 2 tab, 57 ref, append
DESCRIPTORS-- *rock mechanics/ boreholes/ *deformation/ field tests/ loads/ bibliographies/ foundation investigations/ anchors/ displacements/ tension/ elasticity modulus/ cables/ shear strength/ *test procedures/ tensile stress
IDENTIFIERS-- *in situ tests/ *jacking tests/ rock properties/ Boussinesq equation/ plate load tests/ Great Britain/ foreign testing

R202487 67A EARTH PRESSURE CHARTS FOR RETAINING WALLS

SOILS ENGINEERING

The development of a set of curves for computing active earth pressures of cohesionless soils against retaining walls is described. The curves are based on Coulomb's theory and show the relation between active earth pressure and the angle of internal friction, angle of wall face to the vertical, angle of embankment slope to the horizontal, and angle of wall friction. This paper is concerned solely with the problem of soil masses moving downward, relative to the wall for which the wall friction angle is positive. The designer can determine quickly the active earth pressures for a selected combination of variables; the charts give the designer a wide range of values for each variable and readily lend themselves to interpolation. When used with a full understanding of the assumptions and limitations of the Coulomb theory, the design charts offer a means of quickly and accurately calculating earth pressure against retaining walls. The report contains 33 design charts.

R202487 67A

Benson, Fred C
DESIGN CHARTS FOR COEFFICIENTS OF ACTIVE EARTH PRESSURE OF COHESIONLESS SOILS--A RAPID METHOD. Hwy Res Record, No 181, pp 55-76, 1967. Humble Oil & Refin Co, New Orleans, La, 22 p, 34 fig, 3 ref, append
DESCRIPTORS-- *retaining walls/ *design tools/ *noncohesive soils/ *active pressures/ soil mechanics/ soil pressures/ internal friction/ graphical analysis/ *earth pressures/ charts/ curves/ wall friction
IDENTIFIERS-- Coulomb failure theory/ slope angles

HIGHWAY RESEARCH INFORMATION SERVICE

R202488 67A STRESS DISTRIBUTION IN LONG EMBANKMENTS

The distribution of stresses within and under embankments because of embankment weight is of interest to engineers in a variety of applications. Consideration of deformation within embankments, analysis of stability, and consolidation of underlying compressible materials all require determination of the distribution of these stresses. The magnitude and distribution of stress in the foundation material in the vicinity of the embankment were found to be significantly different from those predicted by the usual assumption of stress proportional to embankment height applied to the foundation. Influence charts for a variety of embankment shapes are given. Has 27 references.

R202488 67A

Perloff, W H; Baladi, G Y; Harr, M E
STRESS DISTRIBUTION WITHIN AND UNDER LONG ELASTIC EMBANKMENTS
Hwy Res Record, No 181, pp 12-40, 1967. Purdue U, Lafayette, Ind, 29 p, 28 fig, 27 ref, 2 append
DESCRIPTORS-- *embankments/ *stress distribution/ stress analysis/ stress/ elasticity/ weight/ bibliographies/ homogeneity/ shear stress/ shear/ soil mechanics/ stability analysis/ Poisson ratio/ consolidation/ deformation
IDENTIFIERS-- height/ length

R202513X67A PROGRESSIVE FAILURE IN SLOPES

All evidence indicates that slides in slopes of overconsolidated clays and clay shales are preceded by the development of a continuous sliding surface caused by progressive failure. Requisite conditions for progressive failure are discussed, and the author suggests that progressive failure may result from a large amount of recoverable strain energy in the clay. In clays with weak diagenetic bonds, strain energy is recovered immediately upon a reduction in load. In clay shales, diagenetic bonds are formed when the clay carries its maximum consolidation pressures, thereby locking in recoverable strain energy and releasing it only when the bonds are destroyed gradually by weathering near the surface. Examples of slope failure disasters are cited. Has 61 references.

R202513X67A

Bjerrum, Laurits
PROGRESSIVE FAILURE IN SLOPES OF OVERCONSOLIDATED PLASTIC CLAY AND CLAY SHALES--THE THIRD TERZAGHI LECTURE. ASCE Proc, Jour Soil Mech & Fdns, Vol 93, No SM5, Paper 5456, pp 1-49, Sept 1967, Part 1. Norwegian Geotech Inst, Oslo, 47 p, 21 fig, 3 tab, 61 ref, append
DESCRIPTORS-- *failure /mechanics// *slopes/ *clays/ plasticity/ disasters/ *overconsolidation/ *clay shales/ *landslides/ bibliographies/ weathering/ soil mechanics/ *sliding/ creep/ shear stress/ shear strain
IDENTIFIERS-- *Terzaghi Lecture/ *slope stability/ strain energy/ Bearpaw shale/ *progressive failures/ diagenetic bonds/ high plasticity soils

R202524 67A - SOIL PRESSURES AROUND BURIED PIPES

Distribution of pressure around a buried pipe is analyzed and discussed. The author suggests that present methods of pipeline and culvert design dangerously underestimate the pressure involved. In the initial period of the life of the pipeline, pressures on the sides can reach values approaching the passive level; pressures over the crown will be higher than those caused by simple overburden. As time progresses, lateral pressures are reduced to values commensurate with the earth pressure in the at-rest condition, while vertical pressures tend toward the simple overburden level. Various theories of estimating soil pressure are discussed.

R202524 67A

Mackey, R D
SOIL PRESSURES AROUND BURIED PIPES
Proc, 3rd Asian Regional Conf on Soil Mech & Fdn Engg, Vol 1, Div 1-7, pp 338-341, Haifa, Israel, Sept 1967. SEATO Grad Schl of Engg, Bangkok, Thailand, 4 p, 6 fig, 6 ref
DESCRIPTORS-- *soil pressures/ *pipes/ concrete pipes/ *pipelines/ ditches/ *pressure distribution/ backfills/ bedding materials/ trenches/ underground structures/ culverts/ lateral forces/ compaction/ soil compaction
IDENTIFIERS-- *buried pipes/ pipe bedding/ Marston formula/ pipe cradles/ Spangler formula/ pipe cover/ rigid pipes

R202546 66A LOESS COMPACTION BY FLOODING & EXPLOSIONS

The usual method of compacting slumping loess soils by flooding is hampered or impossible in built-up areas where nearby structures on unflooded soils can be affected. A proposed method makes selective compaction possible in a shorter time with appreciably less damage to surrounding soils. Narrow vertical trenches forming settling joints are excavated to eliminate the binding forces between the flooded and unflooded sections. Drain wells are driven into the zone to be compacted and the soil is flooded. After the water content of the soil exceeds the liquid limit, deep explosions are set off in the soil, causing intense compaction. Underground cavities are not formed at the explosion sites. The usual method and the new proposed method for compacting loess soils were compared by full-scale tests at 2 sites at Zaporozhe, USSR. The experiments confirmed the effectiveness of the new method.

R202546 66A

Litvinov, I M
ACCELERATED METHOD OF DEEP COMPACTION OF SLUMPING LOESS SOILS OF THE II TYPE BY PRELIMINARY FLOODING AND DIRECTED EXPLOSIONS. Soil Mech & Fdn Engg, No 2, pp 116-121, Mar-Apr 1966. 6 p, 4 fig, 1 tab, 2 ref
DESCRIPTORS-- *loess/ *soil compaction/ *soil consolidation tests/ ponding tests/ puddling/ wells/ explosions/ blasts/ settlement/ soil mechanics/ foreign construction/ liquid limits/ trenches/ soil investigations/ *soil stabilization/ underground explosions/ compaction
IDENTIFIERS-- subsidence/ flooding/ USSR/ soil engineering

R202551X67A FORCES ON RIGID CULVERTS UNDER HIGH FILLS

Forces acting on the barrel of a rigid culvert, caused by the dead load of a high fill, may depend on the construction method, presence of organic material, material of the earth's crust, fill properties, and culvert geometries. These features are accounted for by the finite-element method for obtaining approximate solutions to plane problems of linear elasticity. Analytical methods were applied to an actual embankment over a rigid culvert whose barrel was instrumented with pressure meters; analytical results for 2 conditions of the earth's crust, various fill properties, and a hay block placed over the crown of the culvert are compared with recorded pressures. The conclusion was that given a proper description of the material properties, in particular the fill-to-hay modular ratio, an accurate distribution of barrel pressure may be obtained.

R202551X67A

Brown, Colin B
FORCES ON RIGID CULVERTS UNDER HIGH FILLS
ASCE Proc, Jour of Struc, Vol 93, No ST5, Paper 5501, pp 195-215, Oct 1967. Columbia U, N Y, N Y, 21 p, 14 fig, 1 tab, 12 ref, append
DESCRIPTORS-- *culverts/ *embankments/ load distribution/ instrumentation/ elasticity/ pressure sensors/ computer programming/ deformation/ *fills/ *dead loads/ external forces/ pipes/ deterioration/ *loads/ backfills/ *earth pressures
IDENTIFIERS-- *rigid pipes/ finite element method/ arching/ hay/ San Luis Dam, Calif/ organic matter/ analytical method

R202554 67A SOIL ARCH ANALYSIS OF BURIED STRUCTURES

Laboratory observations on buried structures conclude that the Marston theory cannot be used indiscriminately for loads on underground pipe. To allow for pressure redistribution across the top of a buried flat-roofed structure, a different differential element must be assumed. A circular arch-shaped element was chosen for this study, after which location of its soil arch support had to be determined. There is no justification for assuming that the arch extends only across the prism of soil directly above the buried structure. From the theory of elasticity, location of the soil arch support was assumed to be at the location of maximum shear stress within the soil mass. If movement or strain should occur in the soil, the major part should take place in the region of maximum shear stress. Theory of elasticity is used only to locate the region of maximum shear stress before any soil grain slippage occurs. The author proposes that a movement or strain within the soil mass will cause the differential arch to form. A differential equation was written using the circular arch. When all parameters were included, the resulting equation was not readily integrable; therefore, a numerical integration procedure was used. Results are compared with model studies and field installations where adequate information was available. Has 15 references.

R202554 67A

Nielson, F Dwayne
SOIL STRUCTURE ARCHING ANALYSIS OF BURIED FLEXIBLE STRUCTURES
Hwy Res Record, No 185, pp 36-50, 1967. New Mexico State U, University Park, 15 p, 14 fig, 15 ref
DESCRIPTORS-- soil mechanics/ soil pressures/ *stress distribution/ stress analysis/ elastic theory/ *underground structures/ analysis/ laboratory tests/ models/ *earth pressures/ *conduits/ shear stress/ field tests/ elasticity modulus/ differential equations/ loads/ deflection/ stress/ *culverts/ earth movements/ soil investigations/ pressure distribution/ fills/ bibliographies/ buried membranes
IDENTIFIERS-- Marston formula/ *soil arch/ *buried pipes/ *flexible pipes/ *buried structures/ arching/ *flexible structures

R202495 67A COOLING SPIRAL CASES DURING EMBEDMENT

Movement or deformation of turbine components is unrelated to the circulation of cooling water through the spiral case during concrete embedment. This was shown by measurements taken during construction of the San Luis Pumping-Generating Plant. The installation of 8 units afforded an opportunity to study the effects of varying amounts of cooling water circulation. Concrete temperature increases resulting from heat of hydration of the cement were recorded, as were deformations to head cover seats and lower stationary wearing rings. No correlation could be distinguished between increased temperatures in the concrete and measured pump-turbine component deformations.

R202495 67A

McKay, R G
AN INVESTIGATION OF THE VALUE OF CIRCULATING COOLING WATER THROUGH SPIRAL CASES DURING CONCRETE EMBEDMENT--SAN LUIS PUMPING-GENERATING PLANT. USBR Rept SA-8, Struc & Arch Br, June 1967. Bureau of Reclamation, Denver, Colo, 22 p, 10 fig, 3 tab
DESCRIPTORS-- cooling water/ circulation/ temperature control/ turbine parts/ thermocouples/ *spiral cases/ *pump turbines/ heat of hydration/ hydroelectric powerplants/ measuring instruments/ thermal expansion/ field tests/ deformation/ instrumentation/ correlation techniques/ *installation/ *structural analysis/ pumped storage
IDENTIFIERS-- San Luis Pumping-Generating/ *temperature rise/ California/ embedded instruments/ wearing rings

R202547 66A PRECAST COMPOSITE CONCRETE FOUNDATIONS

A more accurate determination of the contact pressures between layers of precast composite reinforced concrete foundations is developed. Contact pressures are determined from an examination of elastic deformations of the layers caused by soil-reaction pressure. Possibility of contact pressure redistribution as a result of the formation of plastic hinges is taken into account in the limiting state. The prerequisite of a linear character of contact pressure distribution between the layers is excluded from the calculation of the foundation. The foundation is calculated independently with respect to length and width, on the assumption of plane bending in each of these directions. Experimental investigations have shown that when a foundation bends, cohesive forces between layers are overcome over the entire length of contact; consequently, only unilateral constraints (compressive normal forces and friction forces caused by them) are possible. This circumstance complicates the selection of the calculation scheme and calculation of the foundation itself, since systems with unilateral constraints are not linearly deformable. Three different analyses of foundations, depending on size ratio of the layers, are discussed and recommendations for design are given.

R202547 66A

Rivkin, S A
CALCULATION OF PRECAST COMPOSITE REINFORCED-CONCRETE FOUNDATIONS UNDER COLUMNS IN TERMS OF STRENGTH AND CRACKING. Soil Mech and Fdn Engg, No 1, pp 25-35, Jan-Feb 1966. 11 p, 6 fig, 2 ref
DESCRIPTORS-- *foundations/ *precast concrete/ *footings/ compressive strength/ cracking/ elastic deformation/ pressure distribution/ buildings/ friction/ structural engineering/ columns/ foreign design practices/ reinforced concrete
IDENTIFIERS-- friction coefficient /mech// USSR

R202516X67A WATER POLLUTION CONTROL REQUIRES ACCURACY

Effective water pollution control is dependent on the acquisition of objective and accurate scientific data on existing water quality. These data must identify specific pollutants, define their concentrations, and describe their effects on present and potential water uses. Such information is essential to the assessment of conditions and the planning and attainment of abatement and for legal action to secure compliance with water quality standards. The role of analytical chemistry in water pollution control is discussed, and the analyst must consider the past history of the sample and desired uses for the water and choose those tests pertinent to water use application. Chemical analysis of water and waste samples can be divided into 2 general classes: specific pollutants present and water quality characteristics. In addition to being a complex mixture, a water sample is a dynamic system undergoing constant change from the time the sample is taken. Analytical sensitivity, precision and accuracy of the analysis, methods, field laboratories, legal aspects, data handling, automated instrument analysis, monitoring techniques, and research needs relevant to water pollution control are studied.

R202516X67A

Ballinger, Dwight G
EFFECTIVE WATER POLLUTION CONTROL REQUIRES ACCURATE DATA
Environ Sci & Technol, Vol 1, No 8, pp 612-616, Aug 1967. FWPCA, Cincinnati, Ohio, 5 p, 1 fig, 1 photo, 4 tab
DESCRIPTORS-- *water pollution/ *pollution abatement/ waste disposal/ pH/ *water quality/ chemical analysis/ wastes/ organic compounds/ automation/ oxygen content/ microorganisms/ sewage effluents/ analysis/ acids/ field tests/ instrumentation/ laboratory tests/ chemical engineering/ data storage systems/ data collection systems/ data processing systems/ water analysis
IDENTIFIERS-- alkalinity/ *water pollution control

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UNIVERSITY OF CALIFORNIA

R202575X67A USING FLOW CHARTS TO SHOW AND TELL

Flow charts can be helpful when planning and developing new procedures, preparing computer programs, eliminating work duplication, training new employees, and pinpointing weaknesses in existing procedures. The 2 types of charts are the general flow chart, indicating highlights of the overall operation and the detailed flow chart, showing all tasks necessary to describe the entire operation. Four key rules to observe when preparing a flow chart are: (1) maintain simplicity, (2) avoid sentences and paragraphs, (3) ensure easy readability, and (4) use standard symbols. Flow chart symbols illustrating standard shapes to be used when graphically referencing a particular function are included. Different types of equipment available for constructing flow charts include flannel boards with precut symbols; metal boards with magnetized symbols; pasteup symbols and flow lines; and pencil, paper, and a template containing the standard symbol cutouts. Flow charts may be used in many ways by different departments. Perhaps their most common uses are pinpointing responsibilities and presenting general outlines of departmental activities.

R202575X67A

Anonymous
USING FLOW CHARTS TO SHOW AND TELL
Supervisory Mgt, Vol 12, No 10, pp 31-34, Oct 1967. 4 p, 2 chart
DESCRIPTORS-- *flow diagrams/ *symbols/ *arrow diagrams/ graphical analysis/ *standards/ *charts/ training/ instruction/ planning/ computer programming/ systems analysis/ management/ methodology/ preparation
IDENTIFIERS-- problem solving/ display systems/ procedures/ management planning/ schematic diagrams

R202581X67A PUTTING ILLUSTRATIONS TO WORK

To succeed in the environment of contemporary technology, engineers must be able to formulate their technical thinking (ideas, data, and know-how) within the disciplines imposed by conventional technical reports. The design of illustrations for such papers is a discrete tool to be mastered as part of the requirements of the profession. The 4 purposes of illustrations are correctness, accuracy, emphasis, and ease of comprehension. For each type of technical illustration (tables, figures, and equations), detailed instructions and examples are given to assist the report writer in achieving these purposes. The term figure includes drawings, sketches, photographs, maps, graphs, histograms, bar charts, pie diagrams, flow diagrams, and balance sheets. They all should have specific but simple titles, be related to the text by number and placed near the reference in the text or, if referred to repeatedly, attached as a foldout to the last page. Equations are valuable for neatly summarizing large amounts of tabulated or plotted data, sometimes suggesting useful applications or extension of the data. Tables are perhaps the most useful method of presenting data in that they give exact numerical values and are not limited by the number of variables.

R202581X67A

Woods, Donald R
PUTTING TECHNICAL ILLUSTRATIONS TO WORK
Chem Engg, Vol 74, No 23, pp 241-246, Nov 1967. McMaster U, Ontario, Canada, 6 p, 6 fig, 3 tab, 5 ref
DESCRIPTORS-- management/ *technical writing/ *editing/ data reduction/ errors/ reliability/ efficiencies/ *communications/ engineering personnel/ mathematics/ scientific personnel/ diagrams/ charts/ graphical analysis
IDENTIFIERS-- *visual aids/ *data presentation/ technical papers/ accuracy/ clarity/ illustrations/ equations/ *communication tools// tables /data/

R202593X67A NEW THINKING IN APPRAISAL THEORY

Real estate appraising is still appropriately described as an art rather than a science. The author contends that it will remain so as long as the fundamental theoretical structure on which practice is based is outmoded, excessively abstracted reality. In the past 5 yr, significantly broadened interest in real estate evaluation has developed among academic students of economics and finance. The stimulating writings of Dr. Richard Ratcliff of the U of Wisconsin have done much to provoke this interest; his concepts and those of the author are reviewed. Concepts that can be put into practice now without controversy are general annuity capitalization, discounted cash flow analysis, property residuals with shorter term projections, analysis in terms of tax structures and investor characteristics, applications of electronic data processing to market data analysis, and critical path programming. Other concepts require further testing through research and case studies before they can be added to the operational tools of the practicing appraiser; these include market simulation, probability analysis, benefit-cost analysis, cost of capital studies, most probable use, and most probable selling price. This research should result in appraisal theory that is more realistic, more descriptive of real estate market activity, and more defensible.

R202593X67A

Kinnard, William N, Jr
NEW THINKING IN APPRAISAL THEORY
Right of Way, Vol 14, No 5, pp 36-49, Oct 1967. U of Connecticut, Storrs, 9 p
DESCRIPTORS-- *land appraisal/ *real property/ right-of-way/ *appraisals/ economics/ industrial plants/ computer programming/ simulation/ marketing/ probability/ benefit-cost ratios/ taxes/ statistical analysis/ decision making/ compensation/ land/ laws
IDENTIFIERS-- *land acquisition/ investment

R202608X67A NEW CONTROLS HELP INSURE QUALITY

Quality control (QC), a management tool to insure that only the highest quality work is produced, has proved as effective for office as for production work. QC enters the office through work measurement systems such as Master Clerical Data (MCD) or through approaches such as Zero Defects. QC departments developing in big organizations have 3 responsibilities: (1) prevention or quality planning in the design stage to check for all potential causes of failure, (2) appraisal or verification that the product delivered conforms to specifications and preparation of test and inspection data, and (3) analysis of the causes for failure and action to remove them. A QC tenet is that errors are not inevitable; efforts should be directed toward doing the job right the first time. Excessive inspection of staff office work decreases quality, but a system like MCD, based on a catalog of time values, study of each worker's capabilities, job audits, and interviews with workers, enables the administrator to adjust personnel to meet varying needs and raise quality as well as quantity. Since human attitudes are very important, personnel must understand the reasons for QC as well as the methods. Specific examples using MCD and other systems are cited.

R202608X67A

Medlin, John
NEW CONTROLS HELP INSURE QUALITY
Admin Mgt, Vol 28, No 10, pp 20-26, Oct 1967. 5 p, 3 fig
DESCRIPTORS-- management/ administration/ *quality control/ motivation/ personnel management/ corrections/ analysis/ *efficiencies/ reliability/ standards/ errors/ applied psychology/ training/ employee relations/ learning/ responsibilities/ supervision/ planning/ employees
IDENTIFIERS-- Master Clerical Data/ Zero Defects

R202632X67A HOW EXECUTIVES WILL MAKE DECISIONS

ADMINISTRATION AND MANAGEMENT

A long-range study on top management conducted by Yale University defined the decision-making patterns that will help future executives cope with the computer age and information explosion. By studying successful and unsuccessful practices in top management today, the best methods for tomorrow become clear. The one-man operation of the directive, controlling executive is obsolete now that all the information and skills available are needed for effective administration. Future organizations will depend less on coercive power and more on the competence of a strong management team. The matrix organization will exist along established lines for routine work, but special teams chosen across organizational lines for applicable skills will provide management with the information needed for sound solutions to planning, innovating, risk-taking, or trouble-shooting problems. These teams will receive in-service training that focuses on individuals in team systems, uses actual problems, can be tested by the effectiveness of results, and is controlled by the participants. Future executives, instead of stamping out intergroup conflict, must learn to manage it so that constructive elements are emphasized. Effective management must define internal environments that challenge people, stretch their aspirations realistically, and help them face interpersonal reality.

R202632X67A

Argyris, Chris
HOW TOMORROW'S EXECUTIVES WILL MAKE DECISIONS
Think, Vol 33, No 6, pp 18-23, Nov-Dec 1967. Yale U, New Haven, Conn, 6 p
DESCRIPTORS-- *decision making/ management/ information retrieval/ *organizations/ technology/ research and development/ organization charts/ responsibilities/ reasoning/ supervision/ *policy matters/ leadership/ human behavior/ employee relations/ *conferences/ efficiencies/ computers/ environment/ education/ universities/ motivation/ committees/ behavior (psychology)
IDENTIFIERS-- interviews/ management engineering/ *executives/ problem solving/ management planning/ risk/ ability/ human relations/ group dynamics/ cooperation

R202562 67A GLEN CANYON DAM DEFORMATION MEASUREMENTS

CIVIL ENGINEERING (GENERAL)

Deformation measurements were made on Glen Canyon Dam over a period of 3 yr. The deformation was caused by seasonal temperature variations, long-term gradual warming of concrete, and loading imposed by impounded reservoir water. Two measurement systems were used: first-order triangulation surveys and plumbline measurements. The measurement systems, field programs, apparatus, observation practices, and procedures adopted to increase efficiency and accuracy are described; representative results are given. Each year, the top of the dam moves about one-half in. during a 60-deg temperature range. The total deformation from the initial measurements to the maximum temperature period in 1966 was about 1-1/2 in. upstream. Surveying methods offer a convenient and reasonably accurate means for measuring dam deformation. More than 1 baseline is recommended in a behavior triangulation net. The time-consuming procedure of turning angles for precise triangulation could be supplemented by using presently available electronic distance measuring devices to reduce the cost and time involved. With these devices, all measured lengths in the control net would be comparable to computed baselines. Experiences indicate dam measurements should be initiated during either the high- or low-temperature period.

R202562 67A

Richardson, Joe T
MEASURED DEFORMATION BEHAVIOR OF GLEN CANYON DAM
Paper, ASCE Ann Mgt & Water Resrcs Conf, New York, N Y, Oct 1967. Bureau of Reclamation, Denver, Colo, 38 p, 15 fig, 3 tab, 6 ref
DESCRIPTORS-- *deformation/ *concrete dams/ movements/ *triangulation nets/ survey stations/ *surveying/ surveying instruments/ theodolites/ *thermal expansion/ plumblines/ temperature/ mass concrete/ arch dams/ baselines/ structural behavior/ first order surveys/ field investigations/ measurement
IDENTIFIERS-- Glen Canyon Dam/ dam stability

R202586X67A KAINJI DEVELOPMENT

The 960-mw Kainji station will be the first of 3 hydroelectric developments aggregating 1940 mw planned to serve the electrical network of Nigeria. The initial installation at Kainji is 320 mw and is planned to furnish the first power in 1968. Kainji Project was designed as the first stage of a multipurpose development. The powerhouse at Kainji initially will contain 4 80-mw generating units, but provision has been made to increase the installation to 12 units totaling 960 mw. The dam will provide numerous benefits in addition to power supply. Two navigation locks and an intermediate basin are being constructed, which, together with other river works will permit navigation from upstream of Kainji to the sea. Regulation of the flow of the Niger below the dam will extend the shipping season and reduce flooding. A fishery industry is planned at Kainji Reservoir to produce over 10,000 tons of fish per annum. At Kainji Dam a new road crossing the river will provide a much needed alternative to the single-track railway and road bridge at Jebba. A 330-kv government transmission grid eventually will extend across southern Nigeria and as far north as Kano.

R202586X67A

Anonymous
THE KAINJI DEVELOPMENT
Water Pwr, Vol 19, No 9 & 10, pp 347-358 & 399-406, Sept & Oct 1967. 20 p, 24 fig, 4 ref
DESCRIPTORS-- *hydroelectric power/ *hydroelectric powerplants/ *multiple purpose projects/ dams// switchyards /electrical// transmission lines/ earth dams/ foundations/ concrete dams/ penstocks/ navigation/ locks/ fish/ instrumentation/ flood control/ hydraulic models/ foreign design practices/ foreign construction/ dam foundations
IDENTIFIERS-- Nigeria/ *Kainji Dam, Nigeria/ site selection

R202601 67A COMPRESSION SEALS IN BRIDGES

A foreseeable trend toward longer-span bridges, together with the realization that a definite causal relationship exists between certain identifiable types of premature bridge distress and ineffective sealing practices, has led to the development of interesting new sealing systems using the compression principle. A photographic study of premature bridge distress was made to understand better the causes of distress and what can be done to minimize the problem. Design engineers should be able to identify, describe, and predict magnitude of each of the types of movement that might occur at the joint interfaces, and performance criteria are established to assist in selecting an effective sealing system. Typical sources and categories of movement phenomena on bridges are described and their importance is emphasized in long-span joint sealing practice. Examples of current sealing systems and solutions in the U S and Europe are illustrated and discussed in terms of performance capabilities.

R202601 67A

Watson, Stewart C
COMPRESSION SEALS IN BRIDGES
Paper, 20th Fall Convention of Amer Conc Inst, Des Moines, Iowa, Oct-Nov 1967. Acme Hwy Products Corp, Buffalo, N Y, 26 p, 56 fig
DESCRIPTORS-- compression// *seals /stoppers// *bridges/ corrosion/ salts/ *bridge design// distortion /structural// aesthetics/ stains/ elastomers/ erosion/ damages/ pressures/ *joint fillers/ *highway bridges/ *sealing compounds/ joints
IDENTIFIERS-- *compression joint seals/ freeze-thaw cycle/ teflon/ bridge decks

R202574X67A STEEL CORROSION IN CONCRETE

Corrosion resistance of steel in portland cement concrete results from a passivating film of gamma ferric oxide. The film is formed and maintained in an alkaline environment produced by cement hydration; however, high concentrations of chloride or bisulfide will cause corrosion if air bubbles form on the steel surface. Laboratory tests were conducted to study corrosion of bare steel rods in environments simulating porous concrete contaminated with chlorides. Results show that the initiation of corrosion requires free oxygen at the steel surface and a ratio of chloride to hydroxyl ion activity of at least 0.6. A probability model is used to explain the chloride effect and predict the threshold value causing corrosion.

R202574X67A

Hausmann, D A
STEEL CORROSION IN CONCRETE--HOW DOES IT OCCUR?
Matls Protection, Vol 6, No 11, pp 19-23, Nov 1967. Amer Pipe and Constr Co, South Gate, Calif, 5 p, 7 fig, 1 tab, 13 ref
DESCRIPTORS-- *corrosion/ steel/ *reinforcing steel/ *reinforced concrete/ concrete/ *concrete technology/ chlorides/ air/ bubbles/ oxygen/ oxidation/ test procedures/ ions/ electric potential/ films/ iron oxides/ chemical stability/ pH/ electrolysis
IDENTIFIERS-- chemical mechanisms/ passive metals/ corrosion tests

R202604X67A BOND & SLIP OF DEFORMED BARS IN CONCRETE

The action of bonding forces and associated slip and cracking are examined for bars with various surface properties. Bond of deformed bars is developed mainly by the bearing pressure of the bar ribs against the concrete. Bars having ribs with steep face angles (larger than about 40 deg with the bar axis) slip mainly by compressing and crushing the concrete in front of the bar rib. Bars with flat ribs slip with the ribs sliding relative to the concrete. Experimental test results are presented to support these conclusions. The stresses and deformations in the concrete caused by bonding forces are discussed. Comparison of ACI Building Code bond and shear equations with bond tests shows that shear provisions rather than bond limitations usually will control the design.

R202604X67A

Lutz, Leroy A and Gergely, Peter
MECHANICS OF BOND AND SLIP OF DEFORMED BARS IN CONCRETE
Jour of ACI, Proc Vol 64, No 11, pp 711-721, Nov 1967. U of Wisconsin, Milwaukee; Cornell U, Ithaca, N Y, 11 p, 13 fig, 13 ref, append
DESCRIPTORS-- *bondings/ *deformed bars/ cracking/ *slipping/ *reinforced concrete/ deformation/ stress distribution/ structural members/ building codes/ shear stress/ codes/ beams/ strain/ shear/ tensile stress/ cracks/ *reinforcing steel
IDENTIFIERS-- *bond/ pull-out tests/ bond strength/ bond tests

R202563X67A SELECTION OF DRILLING METHODS

Production drilling methods for open-pit mining are reviewed. Selecting a particular drilling machine requires value judgements and is the most critical drill evaluation the pit engineer is required to make; determining drillability factors, selecting a feasible method, and estimating performance parameters are the most difficult steps in the entire design procedure. Percussion drilling, rotary drilling, and jet-piercing methods are discussed. A table indicating applicability of various drilling methods for different rock types is included, and a comparison is made of drilling costs per foot for a 9-in. hole.

R202563X67A

Anonymous
DRILLING SELECTION REQUIRES VALUE JUDGMENTS
Mining Engg, Vol 19, No 10, pp 123-126, Oct 1967. 4 p, 2 fig, 2 photo, 1 tab
DESCRIPTORS-- drill holes/ *drilling/ *drilling equipment/ rotary drilling/ jets/ costs/ estimating/ values/ mining/ quarrying/ mining engineering/ boreholes/ *rock excavation/ penetration/ engineering geology/ construction
IDENTIFIERS-- percussion drilling/ jet piercing/ blasting/ rock properties/ drillability index/ *open pit mining

R202564X67A EXCAVATION AND LOADING

Present-day functioning, performance, and operating efficiency of excavating and loading equipment in the mining industry are reviewed. Stripping and quarry-mine shovels, draglines, front-end loaders, and bucket line and hydraulic dredges are discussed, along with power systems, dipper selection, bucket capacity, cycle times, and production rates and costs. Several examples illustrating use of the equipment are given.

R202564X67A

Anonymous
EXCAVATION AND LOADING--A JOB FOR GIANTS
Mining Engg, Vol 19, No 10, pp 132-139, Oct 1967. 8 p, 3 fig, 8 photo, 1 tab
DESCRIPTORS-- *excavation/ *excavators/ *rock excavation/ *earth handling equipment/ loaders/ loading time/ time and motion studies/ shovels/ mining/ dredges/ draglines/ buckets/ costs/ reviews/ production/ mining engineering/ *stripping/ stockpiling/ conveyors/ quarrying/ efficiencies/ construction
IDENTIFIERS-- open pit mining/ earthmoving

R202565X67A BLASTING FRAGMENTATION

Rock fragmentation mechanisms by blasting include slabbing, radial fracturing, crushing, and bursting by the gas bubble. Slabbing depends on the magnitude and shape of the blasting shock wave and tensile strength of the rock. Further fragmentation depends on the amount and energy of gas in the bubble. Blasting rounds are designed from cratering curves relating breaking parameters to explosive energy. Optimum depths from single-charge cratering curves are adjusted for shot geometry in multiple-hole blasting. A large assortment of explosives is available for different blasting requirements; oxygen-balanced explosives, ammonium nitrate blasting agents, metallized explosives, and nuclear explosives are discussed. The design of blasting rounds is presented and the roles of burden, stemming, and subdrilling are explained. Nuclear cratering methods are included, and airblast and ground vibration problems examined.

R202565X67A

Anonymous
BLASTING--FRAGMENTATION IS THE MEASURE
Mining Engg, Vol 19, No 10, pp 127-131, Oct 1967. 5 p, 3 fig, 3 photo
DESCRIPTORS-- *blasts/ explosions/ *explosives/ mining engineering/ *rock excavation/ fragmentation/ drilling/ nuclear explosions/ tensile strength/ vibrations/ shock waves/ cratering/ gases/ drill holes/ detonation/ rocks/ mining/ *excavation// shock /mechanics// charges /explosives// quarrying/ construction
IDENTIFIERS-- rock properties/ high explosives/ *blasting/ *rock breakage/ open pit mining/ ammonium nitrate/ nuclear excavation

R202566X67A HAULAGE METHODS

Railroad, truck, conveyor belt, and hydraulic transport methods are reviewed. The shovel-train system is unexcelled for handling rough rock; the ideal application is in a large but not too deep open-pit mine with transportation distances of over 3 mi. Railroad track location, grades, rolling stock, and track control systems are discussed. Rear dump and tractor-trailer dump trucks are compared and criteria given for evaluating performance. Recent developments in truck powerplants, power transmission, tires, tire treads, and truck bodies are summarized. Several types of belt conveyor constructions have been developed to meet specific conveyor applications; frequently, the components of several types can be adapted to meet a specific application. Prefabricated components; conveyor design; and cable, wire-rope, shiftable, and declined conveyors are discussed. Advantages of hydraulic pipeline transportation are examined briefly. Pilot testing must be performed to accurately design the pipeline and pumping equipment, because each slurry is unique and flow characteristics are different.

R202566X67A

Anonymous
HAULAGE METHODS STRESS SPEED, CAPACITY
Mining Engg, Vol 19, No 10, pp 140-147, Oct 1967. 8 p, 2 fig, 6 photo
DESCRIPTORS-- *transportation/ *hauling/ railroads/ *conveyances/ belt conveyors/ conveyors/ construction/ *earth handling equipment/ pipelines/ costs/ slurries/ performance tests/ quarrying/ rollers/ rock excavation/ motor vehicles/ vehicles/ excavation
IDENTIFIERS-- open pit mining/ materials handling

CONSTRUCTION

R202614X67A PILE-DRIVING FORMULAS FOR FRICTION PILES

Seven different pile-driving formulas were used to calculate the capacities of 93 timber, precast concrete, and steel piles for which field load test data were available. The relationship between the computed and measured capacities was analyzed using the reduced major-axis form of linear regression analysis. Accuracy of the formulas varied with pile type. The Gates, Janbu, and Danish formulas yielded the highest correlation coefficients, followed closely by the Pacific Coast Uniform Building Code and Hiley formulas. Capacities calculated using the Gow and Engineering News formulas correlated poorly with measured capacities. A statistical adjustment was applied to the formulas to bring them into conformance with the field measurements. Adjusted forms of the Gates, Janbu, and Danish formulas were equally accurate and appeared satisfactory for general use, but the Gates formula was simplest to use. Has 16 references.

R202614X67A

Olson, Roy E and Flaate, Kaare S
PILE-DRIVING FORMULAS FOR FRICTION PILES IN SAND
ASCE Proc, Jour Soil Mech & Fdns, Vol 93, No SM6, Paper 5604, pp 279-296, Nov 1967. U of Illinois, Urbana; Norwegian Road Res Lab, Oslo, 18 p, 8 fig, 3 tab, 16 ref, append
DESCRIPTORS-- *piles/ *pile driving/ *friction piles/ sands/ *wood piles/ loads/ precast concrete/ steel/ cohesive soils/ field tests/ soil mechanics/ *bearing capacities/ construction/ bibliographies
IDENTIFIERS-- formulas/ correlation/ sandy loams/ loading tests/ *concrete piles/ *pile-driving formulas/ comparative studies/ *steel piles

DAMS AND HYDRAULIC STRUCTURES

R202607X67A RESPONSE OF EARTH DAMS TO EARTHQUAKES

Principal factors controlling the dynamic response of earth dams are summarized, and time history and distribution of the accelerations produced by an earthquake are discussed. Acceleration records obtained near the epicenter of strong earthquakes are examined to determine the nature of ground movements. In spite of their irregularity, these records are amenable to analysis and the results are extremely useful in understanding strong ground movements. Using these acceleration records, response of typical dam sections is studied and time history and distribution of seismic acceleration in the body of these structures are computed. A number of such records show that: (1) maximum accelerations in dams follow a consistent distribution which may be used in a stability analysis and (2) actual time history of these accelerations can be incorporated in a stability analysis. During strong ground movements, the upper part of an earth dam near the crest is the most vulnerable point. Has 47 references.

R202607X67A

Ambraseys, N N and Sarma, S K
THE RESPONSE OF EARTH DAMS TO STRONG EARTHQUAKES
Geotechnique, Vol 17, No 3, pp 181-213, Sept 1967. U of London, G B, 34 p, 34 fig, 3 tab, 47 ref, 6 append
DESCRIPTORS-- *earthquakes/ *earth dams/ *seismic design/ sliding/ stability analysis/ seismic investigations/ bibliographies/ accelerating// failure /mechanics// displacements/ foreign design practices// faults /geology// soil mechanics/ dam design/ stress relieving
IDENTIFIERS-- *earthquake engineering/ *earthquake loads/ earth slides/ seismic stability/ *seismic studies/ effect/ Great Britain

DAMS AND HYDRAULIC STRUCTURES

R202630X67A PRESSURES ON DAMS DURING EARTHQUAKES

Intensity, distribution, and frequency characteristics of hydrodynamic pressures acting on dams during earthquakes are discussed. A short review of previous work on this subject is presented, with particular emphasis on evaluation of common simplifying assumptions. Including compressibility of water, an analysis is made of the pressures generated on a rigid dam with a vertical upstream face; these results are intended for gravity dams. General expressions for the complete time history of pressures during arbitrary horizontal and vertical ground motions are derived. Ground acceleration data recorded during the 1940 El Centro earthquake were applied to 3 reservoir depths to study the hydrodynamic response to the earthquake. Conclusions were: (1) the concept of an added mass moving with the dam to represent hydrodynamic effects is not valid for earthquake-type excitations and (2) significant errors are introduced by ignoring compressibility of water. Standard design practice, in considering additional water pressures on dams caused by earthquakes, is compared with the theoretical responses. Has 21 references.

R202630X67A

Chopra, Anil K
HYDRODYNAMIC PRESSURES ON DAMS DURING EARTHQUAKES
ASCE Proc, Jour Engg Mech, Vol 93, No EM6, Paper 5695, pp 205-223, Dec 1967. U of California, Berkeley, 19 p, 6 fig, 1 tab, 21 ref, 2 append
DESCRIPTORS-- *dams/ *earthquakes/ *hydrodynamics/ gravity dams/ vertical loads/ accelerating/ lateral forces/ mathematical analysis/ wave action/ design standards/ errors/ water pressures/ bibliographies/ vibrations/ *seismic design/ structural behavior/ *dam design
IDENTIFIERS-- *hydrodynamic pressures/ earthquake engineering/ earthquake loads/ dynamic response/ dynamic loads

DRAINAGE AND GROUND WATER

R202606X67A SEEPAGE STUDY USING MODELS

Studies for overcoming effects of capillary rise in a seepage model with a free surface and the porous medium of sand pretreated with a water-repellent silicone are described. The method of pretreatment is given, and its effect on capillarity and permeability is considered. Use of an electrical probe to locate water surfaces and any associated zones of partial saturation in capillarity and model seepage tests is described. Another technique determines hydraulic potential by electrical analogy applied directly to the model, using the percolating water as an electrolyte. Two-dimensional seepage tests employing these various techniques were performed on 4 types of models: an earth dam, an idealized dam with a parabolic upstream face, a vertical wall, and a uniform open channel. Accuracy with which the free surfaces (and in 1 case, seepage surface) are simulated by the models is assessed. Hydraulic potentials found by direct observation, electrical analogy applied to the model, and calculation are compared. Comparison is made between calculated and measured rates of flow. Extension of these techniques to the study of unsteady 3-dimensional flow with a free boundary through anisotropic soil of composite section is discussed.

R202606X67A

Dixon, R K
NEW TECHNIQUES FOR STUDYING SEEPAGE PROBLEMS USING MODELS
Geotechnique, Vol 17, No 3, pp 236-250, Sept 1967. King's College, London, G B, 19 p, 14 fig, 9 ref, 2 append
DESCRIPTORS-- *capillarity/ *seepage/ porous materials/ *hydraulic models/ sands/ *models/ electric analogs/ three-dimensional/ simulation/ silicones/ *phreatic line/ electrodes/ two-dimensional/ foreign design practices/ permeability/ dams/ earth dams
IDENTIFIERS-- free surface/ flow patterns// probes /instruments// Great Britain

R202567X67A MONITORING TRANSFORMERS FOR FAULT GASES

Gases formed by decomposition of transformer oil when faults occur in the core and coil assembly of an oil-filled transformer are collected in a Buchholz relay. Many years of research on gases collected in relay chambers, as a result of such faults, are reported. The liberation mechanism of gas bubbles in oil is described and composition of the intercepted gases is compared with the causes of gas formation. Gases forming in a transformer often are either not detected by the Buchholz relay or are detected only after a very long time. A technique enabling any generation of gas to be detected at an early stage is described; oil samples are taken from the transformer and the dissolved gases formed by decomposition of insulating material are extracted and analyzed. The method has been used chiefly for monitoring ehv transformers and reactors.

R202567X67A

Dornenburg, E and Gerber, O E
ANALYSIS OF DISSOLVED AND FREE GASES FOR MONITORING PERFORMANCE OF OIL-FILLED TRANSFORMERS. Brown Boveri Rev, Vol 54, No 2/3, pp 104-111, 1967. 8 p, 6 fig, 1 ref
DESCRIPTORS-- *power transformers/ oils/ *gases/ electric insulation/ extra high voltage// *faults /electrical// decomposition/ chromatography/ carbon monoxide/ electric relays/ carbon dioxide/ *transformer oils/ chemical analysis
IDENTIFIERS-- *insulating oil/ insulation/ spectrometry/ argon/ *dissolved gases/ Buchholz relay/ Switzerland/ foreign research

R202570X67A HEATING OF IRON NEAR HEAVY-CURRENT BUSES

The temperature of iron or steel near heavy-current buses often can rise considerably because of eddy-current and hysteresis losses in the metal. Exact calculation of this temperature rise is extremely difficult because various influences can produce wide discrepancies in results. Formulas and curves are derived enabling the limits of temperature rise to be predicted approximately for the most important cases occurring in practical installations. Results of calculations were checked with measurements, and close agreement was obtained. Examples of calculations for single- and 3-phase installations are given.

R202570X67A

Kluge, P and Schaffer, G
THE HEATING OF IRON NEAR HEAVY-CURRENT BUSBARS
Brown Boveri Rev, Vol 54, No 2/3, pp 122-131, 1967. 10 p, 15 fig, 1 tab, 6 ref
DESCRIPTORS-- *heating/ *electric currents/ alternating currents/ *steel/ magnetic fields/ magnetic induction/ hysteresis/ temperature/ calculations/ losses/ electrical resistivity// *bus /electrical// thermal conductivity/ electricity/ electrical engineering/ electric fields/ electric potential/ electrical equipment/ electrical conductance/ hydroelectric powerplants
IDENTIFIERS-- *eddy currents/ *induced currents/ *flux density/ foreign research/ Switzerland/ electric conductors

R202578X67A BRAKING VERTICAL HYDROGENERATORS

Gate leakage torque of hydraulic turbines must be considered in generator brake design; however specifications requiring braking systems for turbine gate leakage not exceeding an amount producing 1 or 2% rated generator torque are not practical. Such specifications assume nonexistent conditions and increase generator cost and maintenance. A more realistic approach should be used, omitting any reference to gate leakage torque from specifications. The relationship of generator friction and windage torques and gate leakage torques of 1 or 2% of generator-rated torque is shown graphically. Possibilities of developing more realistic specifications for generator braking systems are explored.

R202578X67A

Roth, H H
BRAKING VERTICAL HYDROGENERATORS
Allis-Chalmers Engg Rev, Vol 32, No 3, pp 7-8, 1967. 2 p, 2 fig, 1 photo
DESCRIPTORS-- *hydraulic turbines/ torque/ *electric generators/ design/ *specifications/ hydroelectric power/ deceleration/ *brakes/ velocity/ kinetic energy/ costs/ maintenance/ leakage/ gates/ losses
IDENTIFIERS-- wicket gates/ electric machinery

R202579X67A GENERATOR STABILITY AND STATIC EXCITATION

Stability in a power system is capability to restore equilibrium in the event of sudden load disturbances. Static excitation can assist hydro-oriented power systems to maintain transient stability. A series of field tests and computer studies recently completed on hydroelectric systems with long transmission ties shows the need for an ideal excitation system for synchronous generators, i.e., one with a zero time constant or no time lag. A new static (thyristor) excitation system having the ability to reach ceiling voltage quickly at the moment a system fault occurs is discussed. Benefits of static excitation systems are given.

R202579X67A

Van Vranken, W P
IMPROVING HYDROGENERATOR STABILITY WITH STATIC EXCITATION
Allis-Chalmers Engg Rev, Vol 32, No 3, pp 20-22, 1967. 3 p, 5 fig, 1 photo
DESCRIPTORS-- *excitation/ *electrical stability/ *electric generators/ hydroelectric powerplants/ disturbances/ loads/ electronic equipment/ electrical engineering// transmission /electrical// *voltage regulators/ electronics// faults /electrical// field tests/ power factors
IDENTIFIERS-- *static excitation/ thyristors/ electric machinery

R202580X67A CONTROLLING TRANSFORMER OIL QUALITY

Transformer performance is dependent on steps taken to assure consistent oil quality. Because oil provides heat transfer and insulation to all interior parts of oil-filled transformers, manufacturers and users must maintain rigid quality control of the oil. Preparation of an adequate purchase specification and selection of approved suppliers are necessary first steps, but day-to-day control measures (vendor continuity control, receiving inspection, and in-plant process control) ensure continuous high quality of oil received and used.

R202580X67A

Shombert, George, Jr
CONTROLLING TRANSFORMER OIL QUALITY
Allis-Chalmers Engg Rev, Vol 32, No 3, pp 29-31, 1967. 3 p, 1 fig, 1 photo, 8 ref
DESCRIPTORS-- *transformer oils/ *quality control/ contamination/ colors/ heat transfer/ electric insulation/ *inspection/ sampling/ viscosity/ test procedures/ oxidation/ control/ specifications/ specific gravity/ moisture content/ acceptance tests/ electrical resistivity/ test specimens/ test facilities/ dielectrics/ odors
IDENTIFIERS-- *insulating oil/ test results/ dielectric properties

R202583X67A COMPROMISE AIDS ARRESTER SELECTION

Compromise between current limitation and energy dissipation aids in choosing station arresters for protective performance during switching surges. Arrester designs and applications usually are governed by energy dissipation resulting from switching surges. Current-limiting gaps can reduce the switching duty, but trade-offs between current limitations and energy dissipation are involved and present problems. Such trade-offs are discussed to clarify the relationships, and calculations are presented to assist in interpreting oscillograms of switching surge tests on current-limiting arresters. Two simple circuits are used to illustrate the critical nature of arrester-circuit interaction.

R202583X67A

Sakshaug, E C and Heaman, D E
TRADE-OFFS DEVELOPED FOR ARRESTER SELECTION
Elec World, Vol 168, No 19, pp 25-53, Nov 6, 1967. Gen Elec Co, Schenectady, N Y, 4 p, 6 fig, 1 tab
DESCRIPTORS-- *lightning/ *energy dissipation/ electric currents/ circuits/ calculations/ electric potential/ analysis/ electrical networks/ electrical impedance/ electric insulation/ electrical engineering/ electrical equipment// transmission /electrical// alternating currents// substations /electrical// switchyards /electrical// surges
IDENTIFIERS-- *lightning arresters/ *switching surges/ flashover// protection /electrical// spark gaps

R202598X67A CALCULATING D-C CABLE INSULATION STRESSES

High-voltage d-c transmission is becoming increasingly important where heavy loads are transmitted over long distances. While most hvdc transmission will be overhead, a certain amount of insulated cable will be used for underground, submarine, and indoor work. Electrical stresses in the insulation of such cables are important if safe and economical designs are to be developed. Because stress distribution under direct voltage is governed primarily by resistivity, which varies greatly with temperature, it is more difficult to calculate than the corresponding a-c stress distribution. A technique, based on a numerical approach, is presented for calculating stress distribution. This technique permits easy computation of d-c stress distribution. Charts illustrating measured relationships between stress, temperature, and resistivity are given. In cases studied, the maximum d-c stress is decidedly lower than the maximum a-c stress for a given voltage and cable construction. Has 20 references.

R202598X67A

Buller, Francis H
CALCULATION OF ELECTRICAL STRESSES IN DC CABLE INSULATION
IEEE Trans, Vol PAS-86, No 10, pp 1169-1178, Oct 1967. 10 p, 9 fig, 4 tab, 20 ref, 3 append, disc
DESCRIPTORS-- extra high voltage/ *electric cables/ *direct currents/ electric power/ electric potential/ bibliographies/ *electric insulation/ stress/ dielectrics/ temperature/ electrical resistivity/ electrical conductance/ stress distribution
IDENTIFIERS-- buried cables/ submarine cables/ *electric conductors

R202599X67A EXTRA-HIGH-VOLTAGE D-C INSULATOR TESTS

Laboratory tests were conducted by the Bonneville Power Administration (BPA) to determine d-c flashover characteristics of clean and artificially and naturally contaminated transmission line suspension insulators. Direct-current flashover of clean and contaminated insulators in the fog chamber was found to be a linear function of string length up to 350 kv. Comparative data are presented on a number of specimens for clean-wet and contaminated insulators in the fog chamber. BPA's fog chamber tests on artificially contaminated insulators are equivalent to severe natural contamination. Extensive tests made by a European laboratory using BPA's techniques compare very favorably with tests made by BPA. Test equipment, methods, and results are described, and a table useful for selecting insulators when designing ehv d-c transmission lines is included.

R202599X67A

Poland, M G; Scarborough, W E; Hill, H L; Renner, P E
BPA'S EXTRA HIGH VOLTAGE DC TESTS: I--CONTAMINATED INSULATORS
IEEE Trans, Vol PAS-86, No 10, pp 1146-1152, Oct 1967. Bonneville Pwr Admn, Portland, Oreg, 7 p, 7 fig, 1 tab, 5 ref
DESCRIPTORS-- transmission lines/ *extra high voltage/ *direct currents/ bundled conductors/ test facilities/ test procedures/ fogs/ electrical coronas/ *electrical insulation// transmission /electrical// laboratory tests/ electrical engineering/ *contamination/ electrical conductance
IDENTIFIERS-- *electrical insulators/ electric conductors/ *flashover/ test results/ *leakage current/ test transmission lines/ testing equipment

R202600X67A EHV D-C OUTDOOR INSULATOR FLASHOVER TESTS

Laboratory tests constituting one phase of the insulation coordination studies were conducted by the Bonneville Power Administration to determine d-c flashover characteristics of rod gaps, line-to-tower air gaps, and suspension insulator assemblies. Direct-current flashover for test voltages to 725 kv is shown to be a linear function of specimen length for either positive or negative polarity or for wet or dry test conditions. Comparative data on flashover characteristics are given for d-c, a-c, and switching surge test voltages. Test apparatus and procedures used are discussed. Has 21 references.

R202600X67A

Hill, H L; Renner, P E; Poland, M G; Scarborough, W E
BPA'S EXTRA HIGH VOLTAGE DC TESTS: II--OUTDOOR FLASHOVER
IEEE Trans, Vol PAS-86, No 10, pp 1153-1160, Oct 1967. Bonneville Pwr Admn, Portland, Oreg, 8 p, 10 fig, 3 tab, 21 ref, disc
DESCRIPTORS-- extra high voltage/ *direct currents/ transmission lines/ test facilities/ *test procedures/ bibliographies/ *electric insulation/ electrical coronas// transmission /electrical// laboratory tests// impulse tests /electrical// electrical engineering/ transmission towers/ atmospheric precipitation/ characteristics/ contamination
IDENTIFIERS-- *electrical insulators/ *flashover/ leakage current/ *air gaps/ Bonneville Power Admn/ test results/ testing equipment/ *switching surges/ spark gaps

R202615X67A PREPARATION IS KEY TO RELIABILITY IN EHV

New techniques in the preparation of ehv oil-filled equipment for service assures maximum protection of apparatus and safety of workmen and provides substantial savings. The Oklahoma Gas and Electric Co and Doble Engineering Co have collaborated in developing new methods and procedures of using dry air during preparation of large ehv transformers for service. Initial inspection of equipment on arrival at its destination is important. Blocking and tie rods should be checked for indication of movement during transit. Gas pressure in gas-filled equipment should be positive and near factory recorded value when received. The impact recorder should be removed from the railcar and checked in the presence of factory representatives. An internal inspection should be made before unloading; however, safety of inspectors entering the tank must be ensured by partially replacing the nitrogen gas with dry breathing air. Care must be used in field assembly to prevent moisture from entering windings. Field personnel must learn high-vacuum technology and how to use specialized instruments to maintain and restore windings to the degree of dryness and impregnation attained at the factory. Several helpful suggestions for field assembly, safety, and preventing moisture from entering electrical equipment are discussed.

R202615X67A

Locke, A H
PREPARATION IS KEY TO RELIABILITY OF OIL-FILLED EHV APPARATUS
EI&P, Vol 45, No 11, pp 108-113, Nov 1967. Oklahoma Gas & Elec Co, Oklahoma City, 6 p, 1 fig, 6 photo
DESCRIPTORS-- extra high voltage/ *power transformers/ *inspection/ safety/ electrical equipment/ damages/ moisture/ transportation/ railroads/ oxygen content/ moisture content/ *installation/ vacuum apparatus/ inert gases/ instrumentation/ *reliability/ electric insulation
IDENTIFIERS-- *field assembly/ insulating oil

R202628X67A DISTANCE PROTECTION OF TEED CIRCUITS

ELECTRICAL ENGINEERING

Multiended network interconnections such as teed circuits present special problems in protection. The methods of relaying that have been widely applied to plain feeders are of limited applicability to circuits having more than 2 ends within the protected zone. Many of these difficulties and limitations have long been recognized. The authors seek to extend their investigations by providing a detailed account of the range of relaying conditions encountered in different system configurations in relation to the application of distance protection. Factors influencing the measurement of circuit impedance using local-end relaying signals at 3 network terminals are examined, and a method is suggested by which the loci of impedances presented to distance protection on faulted and healthy circuits of single- and double-circuit teed interconnections may be evaluated for different types of faults. Limiting conditions of assessment in the predetermination of settings and characteristic shapes of direct intertrip and blocking schemes are formulated. A computer method is given by which the most advantageous settings may be secured, subject to constraints derived from the interconnection to be protected and the range of prospective fault levels at its terminations.

R202628X67A

Humpage, W D and Lewis, D W
DISTANCE PROTECTION OF TEED CIRCUITS
Proc of IEE, Engl, Vol 114, No 10, pp 1483-1498, Oct 1967. U of Manchester Inst of Sci & Technol, G B, 16 p, 25 fig, 4 tab, 14 ref, append
DESCRIPTORS-- *electric relays/ *circuits/ electrical impedance/ electrical networks/ electric currents/ faults (electrical)/ electrical engineering/ electric power/ electric potential/ computer programming/ investigations/ transmission (electrical)/ electric terminals/ electrical equipment/ loops (electrical)
IDENTIFIERS-- *protection (electrical)/ interconnected systems/ evaluation/ foreign research/ Great Britain/ outages

R202571 67A FOUNDATION DEFORMATIONS OF CONCRETE DAMS

FOUNDATIONS

Stability of concrete dam supports is influenced by forces caused by water pressure and forces transmitted by the dam. Overall forces caused by water pressure exerted directly on the surface of the banks do not change with deformations of the banks, although distribution in the mass depends on mechanical structure. Forces caused by penetration of water into the mass are not known, and their values are estimated from onsite observations. Distribution of forces transmitted by a dam to its foundations depends on movements of the foundations which deform under water pressure on the banks and action of the dam. Accepted methods for calculating these deformations are not correct and a method using new formulas is presented to determine the deformations. There is little difference between results from accepted methods and the new method when applied to thin dams with constant thickness and radii of curvature, located on relatively nondeformable foundations. The proposed method is most applicable to dams on more deformable foundations or high dams with thick arches of small geometrical bend. Analysis of this type of dam requires consideration of the variation of thickness, distribution of forces on the supports, and deformations of the bank caused by water pressure.

R202571 67A

Mladyenovitch, V; Coyne; Bellier
INFLUENCE OF FOUNDATION DEFORMATIONS OF CONCRETE DAMS ON THE FORCES TRANSMITTED TO THE BANKS. Trans, 9th Intl Cong on Large Dams, Vol 1, Ques 32, R 59, pp 965-986, Istanbul, Turkey, Sept 1967. Transl from French, USBR Transl 738, Oct 1967, 19 p, 14 fig, 3 ref
DESCRIPTORS-- *concrete dams/ *dam foundations/ *deformation/ stability analysis/ water pressures/ mathematical analysis/ bending moments/ loads/ pore water pressures/ Poisson ratio/ banks/ foreign design practices/ rock foundations/ *arch dams/ displacements/ hydrostatic pressures/ dam design
IDENTIFIERS-- foreign research/ France/ trial-load method

R202584 67A MONTE CARLO SIMULATION OF PILE ACTION

Interaction of engineered foundations with the earth as a probabilistic environment was investigated. Effect of statistically variable soil deposits on foundation design parameters is of primary concern. The Monte Carlo simulation technique is discussed and applied to a pile foundation problem. Simulation in the context of this paper means that a controlled representation of reality is used to obtain information about the behavior of a system. Replacement of analytical inference with observation by simulation is emphasized. An example is presented for prediction of design variables, such as mean length of friction piles driven into a 2-layer soil deposit overlying rock. Strength of the soil and depth to rock are treated as stochastic variables. Importance of the size of the sample required for a competent simulation is discussed.

R202584 67A

Schimming, B B and Garvey, W A
MONTE CARLO SIMULATION OF PILE PERFORMANCE
Hwy Res Record, No 190, pp 58-64, 1967. U of Notre Dame, Ind, 7 p, 7 fig, 8 ref
DESCRIPTORS-- *pile foundations/ statistical analysis/ *simulation/ design tools/ friction piles/ bearing piles/ numerical method/ *probability/ pile bearing capacities/ *foundations/ *piles
IDENTIFIERS-- *Monte Carlo method

R202596X67A PLANNING A SITE INVESTIGATION

The aim of site investigations is to provide adequate and accurate information for the design of the proposed structure, within the funds allotted. Site investigations can range from a brief site visit to many months of complicated work. Regardless of the magnitude of the investigation, planning and detail supervision will be required. If funds are limited and compromise becomes necessary, reliable information must be provided at the expense of adequacy. Most investigations are performed by drilling and associated techniques. Price ranges are given for various sampling techniques; mobilization cost should be entered as a separate contract item rather than including it in unit prices. Steps in planning the investigation are discussed. Advantage should be taken of any available information on the site (aerial photographs, site inspection, or nearby investigations) before detail planning for the investigation is completed. Three case histories are discussed to illustrate planning and economics of site investigation.

R202596X67A

Hodgson, J D
SOME ASPECTS OF THE PLANNING AND ECONOMICS OF SITE INVESTIGATION
Inst of Engrs, Austrl, Civ Engg Trans, Vol CE 9, No 1, pp 101-106, Apr 1967. Longworth & McKenzie, Sydney, Australia, 6 p, 6 fig, 2 tab
DESCRIPTORS-- planning/ investigations/ *foundation investigations/ costs/ economics/ foundations/ drilling/ *geologic investigations/ *explorations/ soil mechanics/ foreign activities/ *sampling/ projects/ boreholes/ foreign construction
IDENTIFIERS-- Australia

R202613X67A DESIGN OF DYNAMICALLY LOADED FOUNDATIONS

FOUNDATIONS

Practical methods for the analysis of foundations subjected to dynamic loadings are discussed and design methods proposed. The design of foundations subjected to dynamic loads is a trial-and-error procedure. Initial dimensions are selected by considering such factors as dimensions of the equipment or structure to be supported, space available for the foundations, and normal static bearing stress. The trial design must be analyzed to determine its response to the design dynamic loading and then be adjusted and reanalyzed if necessary. These methods of dynamic analysis use a system of lumped masses, springs, and dashpots approximately equivalent to the actual foundation soil system. In such lumped systems the mass represents the inertia present in the actual system while the springs and dashpots, respectively, represent all flexibility and damping present in the actual system. The key step of evaluating the lumped parameters of the system was obtained from theories of footings resting on semi-infinite elastic bodies. Has 50 references.

R202613X67A

Whitman, R V and Richart, F E, Jr
DESIGN PROCEDURES FOR DYNAMICALLY LOADED FOUNDATIONS
ASCE Proc, Jour Soil Mech & Fdns, Vol 93, No SM6, Paper 5569, pp 169-193, Nov 1967. Massachusetts Inst of Tech, Cambridge; U of Michigan, Ann Arbor, 25 p, 7 fig, 6 tab, 50 ref, 2 append
DESCRIPTORS-- design criteria/ design/ *foundations/ *dynamics/ stress/ *live loads/ elasticity modulus/ bibliographies/ models/ earthquakes/ damping/ elastic theory/ coefficients/ Poisson ratio/ laboratory tests/ vibrations/ research and development/ field tests/ analysis/ *flexible foundations/ footings
IDENTIFIERS-- dynamic response/ shear modulus/ shear waves/ mathematical models

R202559 67A SELECTION OF A WATER TUNNEL ROUTE

GEOLOGY AND GEOPHYSICS

Selection of the most favorable route for the Hausjarvi-Helsinki water tunnel will be based on engineering-geological studies. The 60-km-long tunnel, with a cross-sectional area of 10 sq m, will be driven through a migmatitic part of the Svecofennian schist. Geological studies are being conducted in 3 stages: preliminary map and aerial photograph study to select several tentative routes, detailed geological mapping along tunnel routes and seismic surveys at critical places, and economic comparison of the different tunnel routes. Influence of different rocks on blasting, tunnel lining through weak zones, location of shafts to the tunnel, and cost of additional geological studies are discussed. An economic comparison for 3 alternate tunnel routes is given. Has 18 references.

R202559 67A

Niini, Heikki
ON ENGINEERING-GEOLOGICAL STUDIES CONCERNING THE SELECTION OF THE COURSE OF THE WATER TUNNEL HAUSJARVI-HELSINKI. Engg Geol, Vol 2, No 1, pp 39-45, Apr 1967. Natl Brd of Pub Rds and Wtwys, Helsinki, Finland, 7 p, 1 fig, 1 tab, 18 ref
DESCRIPTORS-- *engineering geology/ *tunnels/ tunnel design// *water tunnels /conveyance// *geologic investigations/ rocks/ rock excavation/ geophysics/ bibliographies/ aerial photography/ mapping/ seismic investigations/ costs/ *subsurface investigations/ explorations/ foreign projects/ core drilling/ economics/ drilling/ reconnaissance surveys
IDENTIFIERS-- Hausjarvi-Helsinki Tunnel/ Finland/ blasting/ *site selection

GEOLOGY AND GEOPHYSICS

R202629X67A CHEMISTRY AND THE EARTH

Knowledge of the earth has doubled in the past decade and is forcing a revision of old ideas in light of new findings. The stimulus for research in geochemistry, geology, and geophysics comes partly from man's boundless scientific curiosity and partly from the growing need for natural resources. Dramatic new discoveries on the enigmatic structure of the Mohorovicic discontinuity, radioactive dating, unsuspected inhomogeneity in the mantle, oceanic and continental heat flows, and high-temperature and high-pressure research are providing the scientific impetus. Investigations on continental drift, structure of the earth's core and mantle, age and origin of the earth, and spontaneous sporadic reversals in the earth's magnetic field, perhaps the best described and least understood of all planetary phenomena, are discussed. Practical reasons for earth studies include: increasing the supply of natural mineral resources, Government financing of earth science research, availability of newly developed analytical instruments, need for detection and identification of underground nuclear explosions, earthquake and volcano prediction, disposal of radioactive and industrial wastes, and realization of the potential of geothermal energy sources.

R202629X67A

Sanders, Howard J
CHEMISTRY AND THE SOLID EARTH
Chem & Engg News, Spec Rept, Vol 45, No 42, pp 1A-49A, Oct 2, 1967. 48 p, 6 fig, 39 photo
DESCRIPTORS-- chemistry/ chemical analysis/ earth/ *geochemistry/ *geologic investigations/ geologic formations/ *geology/ geophysics/ heat transfer/ oceans/ land/ minerals/ *natural resources/ nuclear explosions/ radioactive wastes/ earthquakes/ volcanoes/ meteors/ seismic waves/ seismology/ seismic investigations/ magnetic fields/ land resources/ radioactive isotopes/ *engineering geology
IDENTIFIERS-- geothermal investigations/ Mohorovicic discontinuity/ Vela uniform project

HYDRAULICS

R202572X67A PUMP DISCHARGE LINE WATER HAMMER ANALYSIS

In some pumping systems, several 1-way surge tanks are installed to prevent water-column separation in the discharge line when power failure stops the pumps. A method to analyze water hammer in a pumping system of this type is described, assuming that: (1) velocity head in the pipeline is negligible compared with pressure change in the pipeline, (2) distance between the inlet and outlet of the pump is so short that water hammer waves propagate from the 2 points instantaneously, and (3) water levels in the reservoirs do not change during the transient period. To determine transient conditions caused by power failure, water hammer phenomena in the pipeline, inertia of the prime mover and pump, pump characteristics, and other boundary conditions must be considered. Analysis is made by solving the fundamental equations with a digital computer. An example is calculated, and results compare quite favorably with field tests.

R202572X67A

Miyashiro, H
WATERHAMMER ANALYSIS OF PUMP DISCHARGE LINE WITH SEVERAL ONE-WAY SURGE TANKS. Trans of ASME, Jour Engg for Pwr, Ser A, Vol 89, No 4, pp 621-627, Oct 1967. Hitachi Ltd, Tokyo, Japan, 7 p, 8 fig, 3 tab, 8 ref, disc
DESCRIPTORS-- *water hammer/ *pumps/ pipelines/ *surge tanks/ hydraulics/ negative pressures/ waves/ velocity/ fluid friction/ digital computers/ economics/ field tests/ characteristics/ hydraulic transients/ electric power failures/ analysis/ fluid mechanics
IDENTIFIERS-- Japan/ foreign research/ *water column separation/ discharge lines

R202594 67A UNSTEADY FLOW IN CALIFORNIA AQUEDUCT

Hydraulic transients of varying magnitudes resulting from normal and emergency operation of the California aqueduct are discussed in terms of hydraulic theory. The need for evaluating and the method employed in analyzing these unsteady flow conditions are presented. Additional information is provided on the development of the check structure operations necessary to coincide with normal and emergency flow changes. Three additional means of transient analysis are investigated briefly and employed as a means of confirmation.

R202594 67A

Nielsen, G V
ANALYSIS OF UNSTEADY FLOW IN THE CALIFORNIA AQUEDUCT
Tech Memo 28, California Dept of Water Resrcs, Sacramento, Aug 1967. 33 p, 16 fig, 1 photo, 3 ref
DESCRIPTORS-- *unsteady flow/ *open channel flow/ open channels/ remote control systems/ hydraulics/ conveyance structures/ *translatory waves/ mathematical analysis/ computer programming/ canals/ check structures/ fluctuation/ radial gates/ pumping plants/ water waves/ time/ *hydraulic transients
IDENTIFIERS-- *California aqueduct/ mathematical models

R202623X67A THREE-DIMENSIONAL DENSITY CURRENT

A laboratory investigation of a 3-dimensional density current is described. The density current was produced by the release of salt water at the upper end of a sloping floor immersed in a tank of fresh water. The flow regime was classified as laminar, indeterminate, or turbulent for floor slopes up to 20 deg to the horizontal. The lateral spread of turbulent flows was correlated with a Richardson number measured at the injection orifice. Detailed measurements of velocity and density were made at 3 cross sections of 1 turbulent density current on a floor of 20 deg slope. Velocity and density distribution were found to be reasonably self-preserving when described in terms of 2 characteristic length scales: a characteristic width and a characteristic height of a cross section. Maximum velocity varied as X to the minus 0.7 where X was the distance from a finite virtual line source used to locate the free boundaries of the flow. Mean density excess varied as X to the minus 1.1. The entrainment constant E was found to decrease in the direction of flow.

R202623X67A

Trevor, R Fietz and Wood, Ian R
THREE-DIMENSIONAL DENSITY CURRENT
ASCE Proc, Jour Hyd, Vol 93, No HY6, Paper 5549, pp 1-23, Nov 1967. U of New South Wales, Sydney, Australia, 23 p, 11 fig, 2 tab, 9 ref, append
DESCRIPTORS-- *density currents/ *three-dimensional/ hydraulics/ river currents/ turbulence/ *water currents/ laboratory tests/ saline water/ turbulent flow/ velocity/ slopes/ fluid flow/ experimental data/ tanks (containers)/ water measurement/ laminar flow
IDENTIFIERS-- Richardson number/ *stratified flow/ free surface

R202561X67A LONGITUDINAL MIXING IN NATURAL STREAMS

Various models used to describe or predict longitudinal mixing coefficients are examined, and the conditions under which they are expected to apply are discussed. Several hundred coefficients in laboratory flumes and natural streams were measured under 2-dimensional, uniform-flow conditions. Coefficients measured in natural streams agreed with equations derived from flume data. Influence of dead zones in the streams on mixing was examined; measured coefficients were found to be much closer to predicted values when the influence of mixing caused by the dead zones was separated by the use of a new mixing model. Has 27 references.

R202561X67A

Thackston, Edward L and Krenkel, Peter A
LONGITUDINAL MIXING IN NATURAL STREAMS
ASCE Proc, Jour of Sanit Engg, Vol 93, No SA5, Paper 5521, pp 67-90, Oct 1967. Vanderbilt U, Nashville, Tenn, 24 p, 13 fig, 3 tab, 27 ref
DESCRIPTORS-- *mixing/ *streams/ *streamflow/ fluid flow/ two-dimensional/ sanitary engineering/ laboratory tests/ hydraulic laboratories/ flumes/ bibliographies/ hydraulic models/ *dispersion/ diffusion/ turbulent flow/ tracers/ suspended solids/ mathematical analysis/ open channel flow/ roughness coefficients/ water quality/ dyes
IDENTIFIERS-- mathematical models/ dissolved solids/ Rhodamine B// dead zones /hydraulic// longitudinal mixing /hyd/

R202592 66A RESERVOIR WATER TEMPERATURE UNDER ICE

Under the ice cover of deep through-flow reservoirs there is a thermocline where temperature and density gradients increase sharply with depth. The appearance of this layer is attributable to the presence of a current and the known anomaly of thermal expansion of water, whereby water density increases as the temperature increases from 0 to 4 deg C. The interrelationship between the vertical water temperature and current velocity distributions under an ice cover are described for cross sections of various parts of the Bratsk Reservoir. This relationship is explained and its characteristics and determining factors are examined. An equation is proposed permitting determination of discharge and current velocity from water temperature distribution in a given cross section of a reservoir.

R202592 66A

Bulatov, S N
CHARACTERISTICS OF THE TEMPERATURE AND VELOCITY REGIME OF BRATSK RESERVOIR UNDER AN ICE COVER. Soviet Hydrology: Selected Papers, No 3, pp 262-276, 1966. 15 p, 4 fig, 5 tab, 4 ref
DESCRIPTORS-- hydrology/ *ice/ *reservoirs/ thermal expansion/ velocity/ discharges/ density/ *temperature/ gradients/ density currents/ freezing/ laminar flow/ Reynolds number/ water/ *water currents/ cross sections/ velocity distribution/ thermal conductivity/ *streamflow
IDENTIFIERS-- Bratsk Dam, USSR/ USSR/ foreign research

R202602X67A RAINFALL AND RUNOFF RELATIONSHIP

In a period of about 300 yr, we have developed a substantial understanding of the relationship between rainfall and runoff. From Perrault's original crude experiment confirming the causal relationship between rainfall and runoff, we have passed through a lengthy era of empiricism caused largely by inadequate data; a brief period of a quarter century in which a reasonably adequate descriptive picture of the runoff process was devised; and, finally, reasonably rational correlations between precipitation and runoff. In the computer era we have seen the first demonstration that the runoff process may be simulated on a computer with a high order of accuracy. If we take advantage of this development to secure an adequate amount of the proper kinds of hydrologic data, we can look forward to a completely general simulation model which can reproduce the streamflow hydrograph on any stream, gaged or ungaged, with an accuracy at least as good as that of the data supplied to the computer. Has 49 references.

R202602X67A

Linsley, Ray K
THE RELATION BETWEEN RAINFALL AND RUNOFF--REVIEW PAPER
Jour of Hydrol, Vol 5, No 4, pp 297-311, Oct 1967. Stanford U, Calif, 15 p, 49 ref
DESCRIPTORS-- *rainfall/ *runoff/ *correlation techniques/ *surface runoff/ hydrographs/ bibliographies/ watersheds/ reviews/ unit hydrographs/ flood forecasting/ hydrology/ infiltration/ soil moisture/ computer programming/ simulation/ drainage basins
IDENTIFIERS-- hydrologic cycle/ *rainfall-runoff relation/ multiple regression

R202603X67A EVAPORATION VARIATIONS IN TIME AND SPACE

Daily variations in measured and calculated evaporation rates were accounted for by changes in various weather factors, using simple and multiple-regression analyses. Partial correlations indicated that solar radiation accounted for about 70% of the variations in water losses from dish evaporimeters, whereas the corresponding influences of temperature, vapor pressure deficit, and wind, as individual factors, were about 35, 0, and 60%, respectively. However, radiation, temperature, and wind, as component factors, each showed a lower correlation with evaporation, whereas vapor pressure deficit showed a higher and significant correlation. The degree of association between evaporation and weather factors was greater when the number of daily observations used in the analysis was doubled. Multiple-regression analyses showed that the combined effects of the 4 weather parameters were responsible for about 90 and 50% of the observed variations in evaporation and transpiration rates, respectively. Rates of evaporation, calculated by the multiple-regression equations, agreed well with evaporation observed on days other than those used for making the regression. Significant correlations also were found between evaporation from small dishes and a U S Class A pan and between evaporation and transpiration from grass in lysimeters.

R202603X67A

Davenport, David C
VARIATIONS OF EVAPORATION IN TIME AND SPACE--I. STUDY OF DIURNAL CHANGES USING EVAPORIMETERS AND GRASS LYSIMETERS. Jour of Hydrol, Vol 5, No 4, pp 312-328, Oct 1967. U of Nottingham, G B, 17 p, 5 fig, 5 tab, 12 ref
DESCRIPTORS-- *evaporation/ time/ *lysimeters/ temperature/ agriculture/ solar radiation/ vapor pressures// wind /meteorology// crops/ computer programming/ statistical analysis/ grasses/ agronomy/ hydrology/ *diurnal variations
IDENTIFIERS-- transpiration/ *evaporimeters/ regression analysis/ space/ evaporation pans/ foreign research/ Great Britain

R202588 67A IRRIGATION REQUIREMENTS AND SOIL TEXTURE

Minimum annual irrigation water requirements were determined in 17 mature orchards over a 4-yr period by gradually reducing the application rates until the desired minimum soil-moisture contents were achieved. Variations in weather were considered in the scheduling procedure. Criteria used for determining minimum requirements allowed for some wilting of cover crops but not of trees. The soils ranged from a sand to a fine silt loam, with accompanying wide ranges in water-holding capacity, depth of water needed at each irrigation, and safe irrigation intervals in the heat of summer. Highly significant correlations were obtained between the annual irrigation requirement and the soil texture and net evapotranspiration. By multiple-regression, these 2 factors, together with number of days of irrigation, accounted for 91 to 94% of the variation in annual irrigation applications. The conclusion was that the coarser-textured the soil, the greater the annual irrigation requirement. Has 20 references.

R202588 67A

Wilcox, J C
EFFECTS OF SOIL TEXTURE, NET EVAPOTRANSPIRATION AND OTHER FACTORS ON IRRIGATION REQUIREMENTS OF ORCHARDS AS DETERMINED BY A SCHEDULING PROCEDURE. Canadian Jour of Soil Sci, Vol 47, No 3, pp 149-156, Oct 1967. Canada Dept of Agrl, Summerland, 8 p, 6 tab, 20 ref
DESCRIPTORS-- soils/ soil science/ irrigation/ *irrigation practices/ soil moisture/ irrigation O&M/ bibliographies/ *evapotranspiration/ weather/ rainfall/ field tests/ fruits/ trees// consumptive use /water// silty loams/ *water requirements/ *soil texture/ soil structure/ sands/ cover crops
IDENTIFIERS-- *irrigation requirement/ multiple regression/ water application rate/ orchards

R202616 67A ALGAE CONTROL IN IRRIGATION CANALS

Efforts to control algae and aquatic weed growth in the Friant-Kern and Madera Canals of the Central Valley Project in California are described. Canal capacity, particularly in concrete-lined sections, can be reduced significantly by this growth. The Madera Canal capacity was reduced by 29% when algae was allowed to grow unchecked. In a large canal such as the Friant-Kern a loss of 10% of capacity amounted to 900 acre ft/day. Furthermore, with algae conditions present, developing an accurate stage-discharge relationship in the canals for measurement purposes is impossible. Of several different soil sterilants and methods tried, the most successful was dumping fine copper sulfate crystals into the flowing water. Satisfactory algae control was obtained with only 1 lb of crystals per cfs in the Friant-Kern Canal and 2 lb/cfs in the Madera. A description of the successful technique used and breakdown of costs are given.

R202616 67A

Nielsen, Geoffrey D
PRACTICAL METHOD OF CONTROLLING ALGAE IN IRRIGATION CANALS
Paper, ASCE Water Resrcs Conf, New York, N Y, Oct 1967. Bureau of Reclamation, Sacramento, Calif, 25 p, 5 fig, 6 photo, 1 tab
DESCRIPTORS-- *algae/ *irrigation canals/ canals/ *open channels/ weeds/ laterals/ *aquatic weeds/ *weed control/ *copper sulfates/ canal linings/ water measurement/ operation and maintenance/ capacity reduction/ costs/ chemicals/ benefits/ agronomy/ trashracks/ irrigation systems
IDENTIFIERS-- Central Valley Proj, Calif/ *aquatic weed control/ pondweed

R202560X67A EXPERIMENTAL MECHANICS IN DESIGN

Although only a few examples of experimental mechanics and its role in structural analysis are discussed briefly, indications are that such techniques are powerful analytical tools warranting more extensive use. Design problems can be the result of oversights or failure to define the problem. Of the latter, a typical example is the case where a part is overdesigned to reduce the stress, whereas a correct solution would be to remove some of the material from a low stress region. Simple photoelastic models that can be made with a pair of shears and a punch are used to illustrate how design problems can be defined and solved.

R202560X67A

Smith, Clarence R
EXPERIMENTAL MECHANICS IN DESIGN
Matls Eval, Vol 25, No 10, pp 30A-33A, Oct 1967. General Dynamics Corp, San Diego, Calif, 4 p, 7 fig, 7 ref, append
DESCRIPTORS-- *mechanical analysis/ *structural analysis/ laminates/ model tests/ *photoelasticity/ experimental data/ stress analysis/ models/ stress distribution/ *structural models/ *nondestructive tests/ design/ plastics/ joints// fatigue /mechanics// applied mechanics/ engineering mechanics
IDENTIFIERS-- *experimental design/ test results

R202568X67A AUTOMATION IN THE LABORATORY

On-line digital computers are providing new freedom in the design and conduct of laboratory experiments. For the first time the scientist can program his entire experiment by mixing, as necessary, measurements, delays, computations, decisions, reporting functions, and requests for guidance. Steps involved in converting laboratory experiments from classical experimental situations to fully automated processes include: generation of experimental data in machine-readable form, preparation of the experimental plans in computer program format to direct and control the experiment, preparation of a decision-making computer program to join the data analysis program and the input preparation program, and execution of the experimental processes in an on-line environment by electronically connecting the experimental apparatus to the computer. In the last few years, differences between industrial process control and laboratory automation have become clearer. Experience has shown that: (1) laboratory automation is less expensive than industrial process control because the need for reliability and redundancy is not as great and (2) laboratory automation demands much greater versatility in terms of computer hardware and software components. Unfortunately, because techniques of laboratory automation are radical, adequately describing their effects on research is difficult.

R202568X67A

Spinrad, R J
AUTOMATION IN THE LABORATORY
Science, Vol 158, No 3797, pp 55-60, Oct 6, 1967. Brookhaven Natl Lab, Upton, N Y, 6 p, 4 fig, 10 ref
DESCRIPTORS-- *laboratory tests/ *experimental data/ *automation/ *test procedures/ laboratory equipment/ test facilities/ digital computers/ data processing systems/ digital-to-analog converter/ computer programming/ data reduction/ digital recording systems/ computation/ graphical analysis/ punched paper tapes/ systems analysis/ apparatus/ technology/ research and development
IDENTIFIERS-- on-line operation/ testing equipment/ application techniques

R202591X67A FRACTURE TOUGHNESS

Fracture toughness is a relatively new parameter for estimating the ability of a material to arrest a crack that could cause sudden failure below the yield strength. Unlike transition temperature, impact strength, and notched-unnotched strength ratio, fracture toughness appears to be a material constant unaffected by specimen geometry. Fracture toughness represents the critical stress-intensity factor in the vicinity of the crack front and is related directly to the energy for crack propagation. As thicker specimens are considered, the energy needed for crack propagation decreases. At some critical thickness, crack propagation is governed by plane-strain conditions and the stress-intensity factor reaches a minimum. The minimum plane-strain stress-intensity factor is pertinent in materials evacuation because it is a constant essentially independent of specimen dimension. The initiation of slow crack growth also is governed by plane-strain conditions so that the stress-intensity factor not only characterizes total failure in thick sections but controls the stress extending cracks in thinner sections. Examples of fracture toughness applications are given for selection of steel for pressure vessels, evaluating base and weld metals, determining the safety of structures, and predicting fatigue behavior. Basic methods for determining fracture toughness are discussed.

R202591X67A

Steigerwald, Edward A
WHAT YOU SHOULD KNOW ABOUT FRACTURE TOUGHNESS
Metal Progress, Vol 92, No 5, pp 96-101, Nov 1967. Thompson Ramo Wooldridge, Inc, Cleveland, Ohio, 6 p, 3 fig, 1 tab
DESCRIPTORS-- materials/ metals/ *metals testing/ design criteria/ alloys/ pressure vessels/ safety/ *fractures/ *cracking// failure /mechanics// test procedures/ *strength of materials/ *structural design/ strain/ elasticity/ *notch tests/ *toughness/ stress welded joints/ laboratory tests/ materials testing
IDENTIFIERS-- crack propagation

R202621 67A BITUMEN FOR HYDRAULIC STRUCTURES

Bitumen is suitable for many different applications in hydraulic engineering because of its advantageous chemical and physical properties. These properties include high resistance to atmospheric effects; thermoplasticity; insolubility in water; low specific heat; nontoxicity; resistance to acids and caustic solutions; and variable plasticity, depending on the mineral aggregate. Asphalt is often used as an impermeable lining for reservoirs and embankments when other materials are too expensive and external forces require a flexible structure. Paving grade-, oxidized-, cutback-, and emulsion-type bitumens are discussed briefly. Examples are given of the application of bituminous materials on European hydraulic engineering projects for coast protection, reservoir linings, dam construction, harbor engineering, and canal linings.

R202621 67A

Rose, D
BITUMEN FOR HYDRAULIC STRUCTURES
Proc, 7th World Petrol Conf, Mexico City, Mexico, pp 109-130, Apr 1967. BP Benzin und Petrol AG, Germany, 22 p, 12 fig, 13 ref
DESCRIPTORS-- *asphalt/ *asphaltic concrete/ *bituminous materials/ canal linings/ linings/ waterways/ coastal engineering/ earth dams/ rockfill dams/ embankments/ seepage/ reservoirs/ jetties/ beach erosion/ foreign projects/ foreign design practices/ foreign construction/ sea walls/ dikes/ flexible linings/ deformation/ underwater construction/ *hydraulic structures/ channels/ ports/ materials
IDENTIFIERS-- harbors/ asphalt membranes/ asphalt mattresses/ Europe

R202622 67A RECLAMATION USES OF PETROLEUM PRODUCTS

MATERIALS ENGINEERING

Applications of petroleum products in Bureau of Reclamation water resources development projects are described. These applications include asphalt canal linings, asphaltic concrete dam facings, plastic canal linings, plastic cutoff curtains, plastic pipe, and chemical soil sealants. A summary of different types and costs of canal linings installed on Bureau projects is given. Average installation costs of bituminous linings range from $1.50 to $3.00/sq yd for asphaltic concrete, $1.35 to $1.75/sq yd for prefabricated asphalt membrane, and $0.90 to $1.10/sq yd for buried asphalt membrane. The most promising plastic canal lining appears to be polyvinylchloride; over 127,000 sq yd of buried 10-mil-thick-polyvinylchloride membrane have been installed at a cost as low as $0.75/sq yd. Design and construction of hot-mix asphaltic concrete dam facings for Bonny Dam, Colo; Glen Anne Dam, Calif; and Montgomery Dam, Colo, are discussed. Laboratory and field investigations of chemical soil sealants are somewhat encouraging although no material thus far has met completely all requirements satisfactorily. Bureau experiences with other types of bituminous linings, undersealings, sublinings, joint fillers, plastic cutoff curtains, and plastic pipe are summarized briefly.

R202622 67A

Burnett, Graydon E
APPLICATIONS OF PETROLEUM PRODUCTS IN BUREAU OF RECLAMATION CONSTRUCTION
Proc, 7th Intl World Petrol Conf, Mexico City, Mexico, pp 37-53, Apr 1967. Bureau of Reclamation, Denver, Colo, 17 p, 4 photo, 2 tab, 9 ref
DESCRIPTORS-- *canal linings/ flexible linings/ underwater construction/ *asphalt/ *asphaltic concrete/ *bituminous materials/ plastic tubing/ plastics/ linings/ hydraulic structures/ sealing compounds/ joint fillers/ seepage/ cutoffs/ costs/ lower cost canal linings/ membranes/ earth dams/ *buried membranes
IDENTIFIERS-- polyvinyl chloride/ soil sealants/ chemical sealants/ *dam facings/ *asphalt membranes

R202569X67A COMPUTER TIME SHARING--A REVIEW

MATHEMATICS

Time sharing is the simultaneous utilization of a centrally located computer by several users. Generally, the basic hardware used for time-sharing systems is the same as conventional batch processing equipment. Additional hardware features necessary for time-sharing systems include: memory protection, program interrupt, built-in clock, dynamic program relocation, auxiliary storage, and typewriter consoles connected to the computer through communication lines and data transmission terminals. The authors review the present and future services of time sharing and describe the main hardware and software features of a time-sharing computer. Until now, the electronic computer has been used either to relieve man of routine work or carry out complex and lengthy computations. In a time-sharing system, the computer can be used as an assistant to the engineer or research scientist in his creative work, thereby enabling him to scan a large number of solutions quickly. Time sharing is a big step toward the improvement of man-machine relations, as it permits undelayed conversation between man and machine.

R202569X67A

Pointel, Nicole and Cohen, Daniel
COMPUTER TIME SHARING--A REVIEW
Computers and Automation, Vol 16, No 10, pp 38-46, Oct 1967. Lab Central de Telecom, Paris, France, 9 p, 1 fig
DESCRIPTORS-- *computer systems components/ characteristics/ *computers/ computer programming/ *data processing systems/ automation/ reviews/ systems analysis/ methodology/ engineering services/ computation/ communications/ programming languages/ technology/ operations
IDENTIFIERS-- *time sharing/ *software/ man-machine systems/ problem solving/ France/ use potential// *hardware /computer/

R202576X67A HYBRID COMPUTERS

Combining the advantages of analog and digital computers, the hybrid often becomes the fastest and least expensive way of analyzing the dynamics of complex systems. Types of hybrids and their applications, functional subunits, and programming techniques are discussed. Many levels of hybridization have been developed, varying in type from pure analog to pure digital computers. Hybrid computers are best suited for solving: problems involving system optimization and those dealing with distributed parameters (partial differential equations); simulation of problems handled primarily by an analog computer but requiring accuracy and reliability of a digital computer for certain calculations; simulation of problems handled primarily by a digital computer but requiring an analog computer for certain calculations that would be impractical to perform with a pure digital system; and problems requiring simultaneous processing of analog and digital data. Hybrid computers consist basically of 3 functional subunits: analog and digital computers and intracom. The intracom consists of analog-to-digital and digital-to-analog converters, permitting communication between analog and digital computers. Problem-oriented languages such as FORTRAN are well-suited for programming the hybrid; however, special diagnostic and utility programs are also necessary to achieve maximum operating efficiency.

R202576X67A

Bliss, Robert W
HYBRID COMPUTERS
Mach Design, Vol 39, No 25, pp 162-169, Oct 26, 1967. 8 p, 7 fig, 5 photo, 1 tab
DESCRIPTORS-- *analog computers/ *digital computers/ *computer systems components/ digital-to-analog converter/ *digital systems/ computers/ data processing systems/ *simulation/ computer programming/ nonlinear systems/ programming languages/ computation/ integration/ characteristics/ logic/ mathematical analysis/ statistical analysis/ data collection systems
IDENTIFIERS-- *analog-digital computers/ *computer capability/ application techniques/ multiplexing/ optimization/ real-time operation/ time sharing/ FORTRAN/ problem solving

R202577X67A ON-LINE SYSTEMS AND MAN-COMPUTER GRAPHICS

Engineers have acquired new tools for design and analysis through time sharing and visual display systems. Time-sharing systems are designed to provide individual computational service from many remote terminals to a large central processor. Several groups have been developing special man-computer interactive (conversational mode) languages for use at these relatively new terminal facilities. The intent is to provide programming or problem-solving capability directly to users in languages familiar to them. All of these systems are designed to permit the engineer to approach the computer terminal, enter a mathematical problem, and receive an immediate solution. Concurrent with the development of on-line systems has been the growth of visual communications with computers. The powerful synthesis of input with visual output in on-line systems has created a new dimension in computer technology--man-computer graphics (MCG). This concept, having emerged within the past 3 yr, permits the individual to interact with the computer in 2 ways through the medium of visual display. Several applications characterizing MCG include: numerical control (parts programming), electronic design, dynamic analysis, and structural analysis. To achieve the full potential of MCG, a time-shared environment must be employed. Has 39 references.

R202577X67A

Chasen, S H and Seitz, R N
ON-LINE SYSTEMS AND MAN-COMPUTER GRAPHICS
Computers and Automation, Vol 16, No 11, pp 22-28, Nov 1967. Lockheed-Georgia Co, Marietta, Ga; NASA Marshall Space Flight Center, Huntsville, Ala, 6 p, 1 fig, 5 photo, 39 ref
DESCRIPTORS-- graphical analysis/ *data processing systems/ *design tools/ computers/ automation/ programming languages/ bibliographies/ technology/ *computer systems components/ electronics/ dynamics/ structural analysis/ structural design/ mathematical analysis/ computation/ charts/ methodology
IDENTIFIERS-- *on-line operation/ *man-machine systems/ *remote data stations/ time sharing/ visual aids/ display systems/ layout/ methods engineering/ problem solving

R202589 64A OPTIMIZATION TECHNIQUES

Methods for solving the optimization problem and their implications, limitations, and applications are discussed. Methods range from trial-and-error to classical analytic techniques. Trial and error is unworkable with large combinations of variables; classical procedures have not been successful in producing numerical results. A new computational approach, dynamic programming, combines analytical and numerical procedures into functional equations for large high-speed computer manipulation. Up to the point where numerical results are sought by some computational algorithm, classical analysis and dynamic programming are virtually indistinguishable. Solutions are difficult to achieve by either method because of the inherent complexities imposed by boundary-valuedness in classical methods and dimensionality in dynamic programming. Concepts of invariant imbedding and Pontriagin's maximum principle are reviewed for reducing complexities in classical procedures. The most promising computational procedure for overcoming multidimensionality and boundary-valuedness obstacles is linearization and successive approximation. Polynomial approximation to reduce dimensionality and computer memory requirements is covered. An example of setting up the boundary value problem and solving it by classical and dynamic programming methods is given. Has 28 references.

R202589 64A

Peterson, E L
THEORY, METHODS AND APPLICATION OF OPTIMIZATION TECHNIQUES
Paper, Advisory Group for Aerospace R&D, Dusseldorf, W Germany, Oct 1964. Defense Res Corp, Santa Barbara, Calif, 50 p, 28 ref
DESCRIPTORS-- *mathematics/ mathematical analysis/ *optimum design/ peak values/ *boundary values/ calculus/ computation/ bibliographies/ computer programming/ digital computers/ numerical method/ *operations research/ linear systems/ nonlinear systems// series /mathematics// differential equations/ methodology/ computers/ matrix algebra
IDENTIFIERS-- optimum performance/ *optimization/ problem solving/ approximation method/ *dynamic programming

R202617X67A DATA REDUCTION TECHNIQUES

Today's engineer is faced with the burden of collecting increasing masses of test data and reducing the data into meaningful terms for product design and development. The engineer must determine early in the test program how the various test data generated will be used: i.e., long- or short-term storage, mathematical processing or statistical analysis, graphical representation, and similar questions. Two major factors that should be considered when determing how to process data are: amount of data to be generated and degree of mathematical manipulation required to analyze the data. Several approaches to data handling are examined through the use of digital techniques and data processing equipment. Types of storage media reviewed include punched cards, punched paper tapes, magnetic tape, and magnetic disc. A generalized table for comparing cost, flexibility, speed, and volume characteristics of each storage medium is presented. The preprocessor, a small computer used for editing, checking, formating, and compressing source data when operating in a real-time environment, is discussed.

R202617X67A

Decker, Fred
DATA REDUCTION TECHNIQUES
Machine Design, Vol 39, No 27, pp 149-155, Nov 23, 1967. Honeywell Inc, Waltham, Mass, 7 p, 9 fig, 1 tab
DESCRIPTORS-- *data reduction/ *digital recording systems/ *magnetic tapes/ *punched paper tapes/ data collection systems/ digital computers/ magnetic recording/ *data storage systems/ measurement/ calculations/ mechanization/ statistical analysis/ mathematical analysis/ experimental data/ computer programming/ methodology/ records
IDENTIFIERS-- *punched cards/ application techniques/ *preprocessor computer)

R202573X67A ANALYSIS OF VARIABLE-PITCH PUMP TURBINES

A method of analyzing transient behavior of a pump turbine with variable-pitch blades is presented. Equations describing the behavior of a unit during transient periods are found by interpolation of the unit's characteristics. These equations are solved simultaneously with water hammer equations to describe the behavior of an entire system during a transient period. Complete performance characteristics of a variable-pitch pump turbine are presented. Example problems using these characteristics illustrate the method of analysis; they prove that variation in blade pitch is very important in predicting the head across the unit, discharge through the unit, and speed of the unit during a transient period. An application of this method of analysis is given, using a complete set of characteristics for the Forebay pump turbines at the San Luis Unit, Central Valley Project, Calif. Has 23 references.

R202573X67A

DeFazio, F G
TRANSIENT ANALYSIS OF VARIABLE-PITCH PUMP TURBINES
Trans of ASME, Jour Engg for Pwr, Ser A, Vol 89, No 4, pp 547-557, Oct 1967. Harza Engg Co, Chicago, Ill, 11 p, 17 fig, 23 ref, append, disc
DESCRIPTORS-- analysis/ *pump turbines/ hydraulic machinery/ torque/ water hammer/ *hydraulic transients/ bibliographies/ forecasting, curves/ turbine blades/ *characteristics/ discharges/ velocity/ computers/ moments of inertia/ pumps/ impellers
IDENTIFIERS-- Central Valley Proj, Calif/ San Luis Unit, Calif/ *load rejection/ *variable-pitch blades/ Forebay Pump Plt, Calif

R202619X67A GROOVE WELDING OF THICK STEEL PLATE

Studies of metal arcs close to workpiece walls show that a new technique can be used for welding thick materials. The pieces to be joined are placed in a square butt configuration with a 1/2-in. separation. After attaching suitable backing, a large wire is fed into the groove separating the pieces and a straight-polarity arc is energized. As the arc is moved along the groove, the controlled globular transfer that occurs at the specified welding conditions forms a weld bead tying together the previous bead and both walls of the groove. Sound welds in steel plate up to 6 in. thick have been made in the flat position using a 1/8-in.-dia wire at a deposition rate of 24 lb/hr. The guide tube is normally above the workpiece and the wire extension is initially slightly longer than the groove depth. Power is supplied from a nearly flat-slope source with little added inductance at about 33 to 35 v and 400 to 450 amp. Carbon dioxide is quite satisfactory as the shielding gas for welding carbon steel; as much as 90% can be replaced by helium or 50% by argon if a less oxidizing atmosphere is desired. The welding procedure is discussed. A diagram of shielded gas mixtures permitting sound welds and a table of weld properties are included.

R202619X67A

Jackson, J E and Sargent, H B
STRAIGHT-POLARITY GROOVE WELDING OF THICK STEEL PLATE
Welding Jour, Vol 46, No 11, pp 905-914, Nov 1967. Union Carbide Corp, Indianapolis, Ind, 8 p, 13 fig, 3 tab
DESCRIPTORS-- *welding/ welded joints/ *arc welding/ carbon dioxide/ butt joints/ *steel plates/ *thick plates/ electric arcs/ electric currents/ electric potential/ direct currents/ electrodes/ mechanical properties/ mechanical engineering/ notch tests/ cathodes/ helium
IDENTIFIERS-- polarity/ welds/ weldments

R202627X67A BRITTLE FRACTURE OF WELDED STEEL PLATES

MECHANICAL ENGINEERING

The contribution of residual stress and metallurgical damage to low-strength brittle fracture of large, welded, mild steel plates was investigated. Conclusions were: (1) in welded structures residual stress plays a major role in low-stress brittle fracture, and (2) metallurgical damage is a minor factor. Reduction of residual stress by a certain amount corresponded to an increase in load-carrying capacity of about the same amount. A hypothesis is suggested, relating residual stress and load stress to the type of malfunction (ductile failure, full-width brittle fracture, and formation of primary or spontaneous cracks). The hypothesis supports the concept that residual stress and load stress can be combined in design against low-strength brittle fracture. Further analysis of the exhaustion of ductility concept indicates that this concept is valid for unwelded, notched plates but cannot be extended to welded plate specimens. Has 22 references.

R202627X67A

Rosenstein, A H and Lubahn, J D
BRITTLE FRACTURE OF WELDED STEEL PLATES
Welding Jour, Vol 46, No 11, pp 481-S thru 490-S, Nov 1967. U S N Marine Engg Lab, Annapolis, Md; Colorado School of Mines, Golden, 10 p, 12 fig, 4 tab, 22 ref
DESCRIPTORS-- *welded joints/ *residual stress/ *brittle failures/ test procedures/ mechanical engineering/ *welding/ stress relieving/ damages/ yield strength/ bibliographies/ *ductility/ metallurgy/ heat treatment/ plastic deformation/ research and development/ steel plates/ fractures/ steel
IDENTIFIERS-- welds

R202587X67A NEW CONCEPTS IN POWER PLANNING

PROJECT PLANNING

The author contends that present concepts governing use of natural power resources are outdated and wasteful. Rationalization by acceptance of the real value of today's water and effects of long-term inflation and improving thermal efficiencies are of vital importance. A new dimension to accepted thinking is introduced and could result in a radical worldwide shift in favor of water power. Topics examined include: (1) adequacy of the existing economic framework within which alternative power resources are examined for the needs of today and tomorrow, (2) inherent characteristics of the various sources of power, and (3) economic studies made today for withstanding the test of time to provide power at a predetermined rate without being distorted by inflation. The discussion is confined to the waste involved in not using water power when it is available, waste involved in using other fuels for generation of electric energy at low rates of conversion, and effect of inflation on costs of generation.

R202587X67A

Anand, T R
AN APPRAISAL OF CURRENT POWER DEVELOPMENT CONCEPTS
Water Pwr, Vol 19, No 10, pp 421-426, Oct 1967. 6 p, 1 fig
DESCRIPTORS-- project planning/ *electric power costs/ indirect benefits/ electric power demand/ investigations/ water costs/ natural resources/ power marketing/ cost comparisons/ *hydroelectric power/ thermal power/ *optimum development plans/ economics/ optimum use/ resource conservation/ resource development/ water resources/ costs/ obsolete equipment/ electric power
IDENTIFIERS-- Great Britain/ foreign research/ fuel costs/ water values/ long-term planning/ national economy/ economic evaluation/ nuclear fuels/ fossil fuels

R202590 67A SITE INVESTIGATION PLANNING

Stages of site investigation in common practice on engineering projects in Britain and America are reviewed. To help logistical and technical appraisal of an investigation, critical path planning based on the anticipated geology of the site is discussed. A basic 3-stage site investigation scheme is presented: the preliminary site exploration and detailed site investigation, both of which are more or less completed before construction starts, and the foundation investigation conducted during construction. Case histories are given illustrating how geometry of the site geology, together with engineering requirements of the project, can be used to guide the layout and program of the investigation and help establish criteria for design parameters. Gives 18 references.

R202590 67A

Fookes, Peter G
PLANNING AND STAGES OF SITE INVESTIGATION
Engg Geol, Vol 2, No 2, pp 81-106, Aug 1967. Imperial College of Sci and Tech, London, G B, 26 p, 12 fig, 18 ref, append
DESCRIPTORS-- *reservoir sites/ planning/ projects/ *investigations/ *geologic investigations/ explorations/ *subsurface investigations/ *damsites/ foundation investigations/ geology/ reconnaissance surveys/ project planning/ engineering geology/ foreign design practices/ bibliographies/ *locations
IDENTIFIERS-- *site selection/ Great Britain/ Jari Dam, Pakistan/ Pakistan/ Sukian Dam, Pakistan

R202620X67A GROSS DOMESTIC PRODUCT OF IRRIGATION

A method of evaluating secondary incomes (mainly urban) resulting from a completed irrigation project is described. The method consists of building a financial model of the irrigated zone including its market town. Four main conclusions are reached: (1) secondary incomes, or the gross domestic product (GDP), from an irrigation project can be estimated with a reasonable degree of accuracy from ascertainable data; (2) on any given increase in agricultural goods sold, the rise in secondary GDP can be calculated to amount to between 150 and 350% of the increase, while tax yields will be anything from over 40 to 100% of it; (3) an irrigation project which is technically successful but cannot be wholly paid for from increased farm profits is likely to be fully economical from the national viewpoint when the taxes it generates are credited to it; and (4) farmers are likely to benefit least from irrigation projects and should not be charged more than their proportion of the cost.

R202620X67A

Tainsh, J A R and Lock, G W
EVALUATING GROSS DOMESTIC PRODUCT OF IRRIGATION
World Crops, Vol 19, No 4, pp 32-36, Sept 1967. Intl Business Consultants, London, G B, 5 p, 5 fig, 2 tab
DESCRIPTORS-- *crops/ agriculture/ benefit-cost ratios/ *economics/ taxes/ project planning/ irrigation/ models/ cities/ urban areas/ capital costs/ irrigated land/ purchasing/ *benefits/ marketing/ statistical analysis/ analysis/ projects/ *indirect benefits
IDENTIFIERS-- income/ *gross domestic product/ farms/ economic feasibility

R202582X67A _ FAILURE OF GRANULAR MATERIAL

Biaxial compression tests were performed on steel balls of equal size to further the theory of mechanics of granular material proposed by Mogami. Most of the assumptions contained in the theory were verified by experimental observation. A flat box composed of 4 movable sidewalls and a plate glass bottom was used in the experiment. Two opposite walls could be moved toward each other simultaneously while the other pair of walls was at rest until the horizontal forces exerted by the particles exceeded the resisting force of the friction between walls and glass bottom. When a loosely packed assemblage of steel balls is compressed it becomes denser until the void ratio approaches a certain critical value before failure. The value k, previously proposed as a parameter relating void ratio, change in void ratio, and shearing strain, was found to be almost constant at failure regardless of the initial arrangement of the balls. However, the critical void ratio obtained from this investigation does depend on the initial arrangement. Expressions relating void ratio and angle of internal friction obtained earlier are still valid even if nonzero constant values of the critical void ratio obtained from these experiments are introduced. Several photographs of the configuration of the balls during compression are included.

R202582X67A

Mogami, Takeo and Imai, Goro
ON THE FAILURE OF THE GRANULAR MATERIAL
Soil and Fdn, Vol 7, No 3, pp 1-19, Aug 1967. U of Tokyo, Japan, 19 p, 13 fig, 2 tab, 5 ref
DESCRIPTORS-- *granular materials/ void ratios/ deformation/ laboratory tests// *failure /mechanics// *biaxial compression/ laboratory equipment/ test procedures/ apparatus/ internal friction/ shear stress/ shear planes/ shear strain/ *soil mechanics/ compression
IDENTIFIERS-- foreign research/ Japan

R202585 67A ANISOTROPIC CONSOLIDATION OF CLAY

If a soil specimen is consolidated under any conditions other than those to which it has been subjected previously, its structure will be altered and changes in its strength characteristics will result. An anisotropically consolidated remolded homogeneous clay was investigated to determine effect of secondary inherent strength anisotropy (caused by variation of the consolidation stress path and principal consolidation stress ratio) on the strength response of the clay. Findings indicated that strength characteristics were influenced by: (1) initial soil structure before anisotropic consolidation or primary inherent strength anisotropy and (2) structural rearrangement of particles caused by anisotropic consolidation or secondary inherent strength anisotropy. The stress path followed to obtain a given principal consolidation stress ratio influenced soil response. Pore-pressure values during a strength test decreased with increasing values of the principal consolidation stress ratio. With one exception, respective failure strains for the maximum deviator stress and stress ratio failure criteria were approximately equal. Water content for a given octahedral normal consolidation stress decreased with increasing values of the principal consolidation stress difference.

R202585 67A

Khera, Raj P and Krizek, Raymond J
STRENGTH BEHAVIOR OF AN ANISOTROPICALLY CONSOLIDATED REMOLDED CLAY
Hwy Res Record, No 190, pp 8-18, 1967. Northwestern U, Evanston, Ill, 11 p, 8 fig, 5 tab, 11 ref
DESCRIPTORS-- *consolidation/ clays/ remolded soil samples/ *shear strength/ *anisotropy/ shear failures/ stress-strain curves/ soil structure/ soil tests/ test procedures/ pore pressures/ saturation/ *soil mechanics/ laboratory tests/ moisture content
IDENTIFIERS-- stress ratio/ deviator stress

R202597X67A A REVIEW OF THE VANE TEST

The theory and application of the vane shear test is reviewed for materials that are saturated and indicate a zero angle of shearing resistance in the unconsolidated, undrained triaxial test and for materials that are partially saturated and exhibit an angle of shearing resistance in the unconsolidated, undrained triaxial test. Theory of the vane test for materials with an angle phi of zero is well developed and results of sampling investigations and in situ failures confirm this theoretical work. The vane test can be used with confidence for short-term end-of-construction analyses in nonfissured, saturated clays. The test has been found to be extremely useful in very soft and sensitive clay soils. Experimental results of vane tests in fissured clays, sandy clays, and sands, giving an angle of shearing resistance phi in the undrained triaxial test are described. Little correlation with any existing theories has been determined. As the mechanics of the vane test in inserting and rotating the vane in these soils is extremely complex, their behavior should be determined in the triaxial test where the stress conditions can be more closely controlled. Has 111 references.

R202597X67A

Cox, J B
A REVIEW OF THE VANE TEST
Inst of Engrs, Austrl, Civ Engg Trans, Vol CE 9, No 1, pp 19-30, Apr 1967. Kinnaird, Hill, de Rohan & Young, Norwood, Australia, 12 p, 10 fig, 2 tab, 111 ref, disc
DESCRIPTORS-- *vane shear tests/ *clays/ internal friction/ torque/ field investigations/ *shear failures/ reviews/ bibliographies/ sampling/ *shear strength/ apparatus/ foreign design practices/ test procedures/ laboratory tests/ *soil mechanics
IDENTIFIERS-- in situ tests/ failure surfaces/ undisturbed soils/ *undrained shear strength

R202609X67A VIBRATORY PENETRATION OF SOILS

A vibratory penetration process for soils is analyzed. The direction of vibrational motion is the same as the direction of penetration. An approximate expression is found for penetration rate of a flexible penetrator with applied bias and harmonic forces. The penetrator is modeled as 2 masses joined by an elastic member with damping. Modified Coulomb friction is used to characterize soil resistance. The approximate expression is compared with analog computer measurements and an exact theory (developed for the limiting case of zero front mass and internal damping) and is found to give good agreement in the range of small excess harmonic force amplitude. Comparison with a rigid penetrator is made, and the flexible penetrator is shown to have the important design advantage of lower weight or lesser applied harmonic force for equal penetration rates. Four general approaches explaining the effects of vibration on soil penetration are given and discussed.

R202609X67A

Senator, M
VIBRATORY PENETRATION OF SOILS
Trans of ASME, Jour Engg for Ind, Ser B, Vol 89, No 4, pp 759-765, Nov 1967. Bell Telephone Labs, Inc, Murray Hill, N J, 7 p, 10 fig, 7 ref
DESCRIPTORS-- *vibrators (mechanical)/ *vibrations/ *penetration/ soils/ analog computers/ damping/ design criteria/ research and development/ *soil mechanics/ frequency/ skin friction/ pile driving/ piles/ soil tests
IDENTIFIERS-- harmonics/ Coulomb theory/ amplitude/ forced vibration

R202610X67A FINITE-ELEMENT ANALYSIS OF SEEPAGE

A general method of steady state seepage analysis using the finite-element method is developed for use on the digital computer. The method is based on the concept of representing the continuous distribution of pressure head in the region of flow by values of head at a finite number of points. The seepage problem is considered solved when the head at these points is known. Seepage through dams and around a double-wall cofferdam near the face of a slope is considered. The seepage region may be nonhomogeneous and nonuniformly anisotropic. A method of locating the top flow line or seepage line within specified limits of accuracy is presented. With this capability, the method is general enough to solve any practical problem of steady seepage. Solution of any seepage problem is reduced to a standard simple routine requiring negligible engineering time. The computer routine used by the method and an example problem are discussed.

R202610X67A

Finn, W D Liam
FINITE-ELEMENT ANALYSIS OF SEEPAGE THROUGH DAMS
ASCE Proc, Jour Soil Mech & Fdns, Vol 93, No SM6, Paper 5552, pp 41-48, Nov 1967. U of British Columbia, Vancouver, Canada, 8 p, 6 fig, 4 ref, append
DESCRIPTORS-- *earth dams/ *seepage/ *analysis/ steady flow/ mathematical analysis/ water pressures/ *flow nets/ cofferdams/ anisotropy/ numerical method/ permeability/ flow diagrams/ sheet piling/ computer programming/ foreign design practices
IDENTIFIERS-- *finite element method/ foreign research/ Canada

R202611X67A EMBANKMENT DRAINAGE AFTER DRAWDOWN

A method is presented for determining the position of the saturation line and percent drainage in the upstream portion of an earth dam following complete or partial drawdown of the reservoir. The method is based on: (1) a dimensionless time factor which is a function of elapsed time, permeability, effective porosity, and boundary conditions; and (2) a drawdown ratio expressing the drop in reservoir elevation as a function of the original height of water above the slope. Since an evaluation of slope stability under drawdown conditions is dependent upon pore pressures related to the position of the saturation line, a quick method of predicting its location is desirable. Drainage theory used in this method is similar to the approach proposed by Casagrande for evaluating base course drainage of airfield pavements and later adapted by Shannon for use in dams. Expressions are derived for predicting the effect of partial drawdown. Model studies indicate that hyperbolas related to a coordinate system (a function of the time factor and drawdown ratio) can be used to define the saturation line.

R202611X67A

Newlin, Charles W and Rossier, Stanley C
EMBANKMENT DRAINAGE AFTER INSTANTANEOUS DRAWDOWN
ASCE Proc, Jour of Soil Mech & Fdns, Vol 93, No SM6, Paper 5557, pp 79-95, Nov 1967. Arizona State U, Tempe; Woodward-Clyde-Sherard & Assoc, Philadelphia, Pa, 17 p, 11 fig, 5 ref, 2 append
DESCRIPTORS-- *embankments/ drainage/ *drawdown/ flow nets/ pore pressures/ *pore water pressures/ saturation/ *earth dams/ porosity/ permeability/ *model tests/ models/ laboratory tests/ curve fitting/ research and development/ phreatic line/ mathematical analysis/ seepage/ homogeneity
IDENTIFIERS-- Darcys law/ slope stability/ rapid drawdown

R202612X67A CLASSIFICATION & IDENTIFICATION OF SHALES

Shale has been regarded as a troublesome and generally undesirable foundation material; however, all shales do not create foundation problems. A classification system distinguishing the problem shales from the nonproblem shales is proposed. From an engineering viewpoint, a classification based on physical properties such as compressive strength, peak and residual shear strength, activity ratio, potential swell, elastic modulus, and predominant clay minerals is more useful in predicting probable in situ behavior of shale than a purely geological classification. Shales can be classified broadly into 2 groups as compaction or soil-like shales and cemented or rock-like shales. Generally rock-like shales provide satisfactory foundations with a minimum of problems, whereas case histories are replete with failures of structures and slopes founded on compaction shale, particularly clay shales. Clay shales are the major problem shales; in many cases their in situ behavior is unpredictable and puzzling in spite of thorough field and laboratory investigations. A table relating probable in situ behavior with physical properties is included along with a table indicating the physical properties of several North American shales. Has 38 references.

R202612X67A

Underwood, Lloyd B
CLASSIFICATION AND IDENTIFICATION OF SHALES
ASCE Proc, Jour Soil Mech & Fdns, Vol 93, No SM6, Paper 5560, pp 97-116, Nov 1967. Corps of Engrs, Omaha, Nebr, 20 p, 3 fig, 2 tab, 38 ref
DESCRIPTORS-- *shales/ clay shales/ *soil classifications/ classifications/ foundations/ bibliographies/ *physical properties/ compressive strength/ elasticity modulus/ cohesion/ internal friction/ dry density/ sedimentary rocks/ moisture content/ clay minerals/ soil structure/ permeability/ pore pressures/ shear strength/ geology/ *engineering geology
IDENTIFIERS-- *cementation/ strain energy/ in situ rock

R202618 67A STRAIN ENERGY AND OVERCONSOLIDATED SOILS

Quantitative evidence, gathered from a series of large-scale consolidation tests, supports Bjerrum's recently presented strain energy hypothesis. The hypothesis qualitatively explains the behavior of overconsolidated clays and phenomena of long-term slope failures in these soils. The coefficient of earth pressure at rest was found to be a function of strain energy at a given value of the overconsolidation ratio. Degree of disintegration of overconsolidated soils during a slaking test is shown to be related to strain energy. Tests indicate that mineralogy and the capacity of a soil to adsorb strain energy are related. Evidence suggests that certain physicochemical properties may be related quantitatively to mechanical properties through the concept of strain energy.

R202618 67A

Brooker, Elmer W
STRAIN ENERGY AND BEHAVIOUR OF OVERCONSOLIDATED SOILS
Canadian Geotech Jour, Vol 4, No 3, pp 326-333, Aug 1967. U of Alberta, Edmonton, Canada, 8 p, 5 fig, 2 tab, 8 ref
DESCRIPTORS-- *strain/ *energy absorption/ *overconsolidation/ laboratory tests/ *stress-strain curves/ soil physical properties/ internal friction/ consolidation/ deformation/ clays/ remolded soil samples/ *soil mechanics/ earth pressures/ stress relieving/ plasticity/ slaking/ mineralogy/ soils/ disintegration/ weathering
IDENTIFIERS-- *strain energy/ diagenetic bonds/ foreign research/ *slope stability/ Canada

R202633 67A DISTURBED SOIL AFFECTED BY POROSITY

SOILS ENGINEERING

The effect of soil packing as measured by bulk density and hence porosity on the hydraulic properties of 3 disturbed soils was studied and results are reported. Soil packing as measured by bulk density and porosity is related to bubbling pressure, pore-size distribution index, and permeability. With a light hydrocarbon oil as the wetting fluid, the pore-size distribution index was changed only slightly over a wide range of porosities. Permeability and bubbling pressure, on the other hand, were changed severalfold over the same range of porosities. For modeling purposes, 1 requirement for similitude between model and prototype is identical values of pore-size distribution index. Evidently, bubbling pressure may be adjusted to suit the size of the model by changing the packing density without appreciably changing the pore-size distribution index.

R202633 67A

Laliberte, G E and Brooks, R H
HYDRAULIC PROPERTIES OF DISTURBED SOIL MATERIALS AFFECTED BY POROSITY
Soil Sci Soc of Amer Proc, Vol 31, No 4, pp 451-454, July-Aug 1967. Canada Dept of Agr, Lethbridge; Oregon State U, Corvallis, 4 p, 6 fig, 2 tab, 5 ref
DESCRIPTORS-- porous materials/ *porosity/ soils/ capillarity/ *density/ saturation/ drainage/ loams/ soil science/ disturbed samples/ models/ sands/ silty loams/ oils/ particle size/ laboratory tests/ permeability/ compaction/ soil mechanics/ soil physical properties/ bubbling pressures
IDENTIFIERS-- similitude/ pore size/ porous media/ *hydraulic properties/ capillary pressure head/ *soil density/ bulk density

R202595X67A PRESTRESSED CONCRETE USED IN POWERPLANTS

STRUCTURAL AND ARCHITECTURAL ENGINEERING

Large intake structures, penstocks, and spiral casings for the 3 low-head hydroelectric power stations comprising the Lower Derwent Power Development, Tasmania, were designed as prestressed concrete structures. The prestressing techniques reduced expected differential deflections transmitted to the main bearings, improving the operating conditions of the powerplants. Meadowbank Power Station having the highest operating head of the 3 stations is discussed in greatest detail. Prestressed concrete was used in the design of the stations because of high loads imposed on the components, economy over steel, and more watertight structures than regular concrete would produce. Meadowbank is the first power station in the world to have a spiral of prestressed concrete. The Freyssinet 12-1/2-in. Multi-Strand prestressing system was chosen mainly because of construction expediency. The foundation at the Meadowbank station consists of rock with vertical joints containing relatively wide bands of soft material. Since the rock could not be relied on to produce a support sufficiently unyielding to prevent cracking of the concrete spiral, the structure was designed to be self-supporting without assistance from the foundation. Stressing techniques and safety during stressing are discussed. Jacking tests on the Meadowbank spiral case are included in an appendix.

R202595X67A

Woollard, H C V and Smith, G E J
SOME APPLICATIONS OF PRESTRESSING TECHNIQUES TO HYDRO-ELECTRIC POWER STATIONS. Inst of Engrs, Austrl, Civ Engg Trans, Vol CE 9, No 1, pp 137-150, Apr 1967. Hydro-Elec Comm, Tasmania, Australia, 14 p, 17 fig, 3 tab, 10 ref, append, disc
DESCRIPTORS-- *prestressed concrete/ *powerplants/ *hydroelectric powerplants/ penstocks/ *spiral cases/ intake structures/ safety/ design/ rock foundations/ foundations/ *structural design/ structural stability/ stressing cables/ stress/ codes/ coefficients/ friction/ prestressing/ field tests/ foreign design practices
IDENTIFIERS-- Tasmania, Australia/ stability/ jacking tests

STRUCTURAL AND ARCHITECTURAL ENGINEERING

R202605X67A GYPSUM MORTAR FOR MODELS

In using small-scale models for determining inelastic response of reinforced concrete structures, accurate modeling of materials is one of the most difficult problems. A high-strength gypsum mortar was investigated as a model material for simulating concrete in small-scale models. Similitude requirements for model materials are discussed briefly, and tests are described for determining the appropriate physical properties of trial mixes. Gypsum mortar is shown to behave similarly to prototype concrete and has several advantages over model cement mortars. Size effects on compressive and tensile strengths are studied and a surface sealing technique is used to reduce size effects. Charts for proportioning mixes of different strengths and several references on successful applications of gypsum mortar are included.

R202605X67A

Sabnis, Gajanan M and White, Richard N
A GYPSUM MORTAR FOR SMALL-SCALE MODELS
Jour of ACI, Proc Vol 64, No 11, pp 767-774, Nov 1967. Cornell U, Ithaca, N Y, 8 p, 7 fig, 2 tab, 8 ref, append
DESCRIPTORS-- *models/ *model tests/ *structural models/ simulation/ mixes/ *mortars/ *gypsums/ materials/ compressive strength/ tensile strength/ stress-strain curves/ sizes/ reinforced concrete/ *concrete structures/ sealing compounds/ concrete/ molding/ structural behavior
IDENTIFIERS-- similitude/ concrete properties

WATER RESOURCES

R202624X67A SUPPRESSING SNOW EVAPORATION

Studies in California, Sweden, and Lapland indicate evaporation from snow can be reduced by applying long-chain fatty alcohols. The physical action of long-chain alcohols on snow is not known and information is needed on spreading rates and distribution patterns. Laboratory studies at Colorado State University (under contract with the Bureau of Reclamation) on the spreading of hexadecanol on a melting snow surface are described. Carbon 14 labeled hexadecanol and autoradiograph techniques were used to determine hexadecanol distribution on a melting snow surface. Snow-filled evaporation pans treated with several long-chain alcohol powder and emulsion mixtures were used to determine reductions in evaporation. Results indicate that long-chain alcohols can spread on a melting snow surface and that a 10% hexadecanol-octadecanol emulsion is superior to powder applications. Further studies are necessary to determine the practicality of field applications.

R202624X67A

Meiman, James R and Slaughter, Charles W
LONG-CHAIN ALCOHOL SUPPRESSION OF SNOW EVAPORATION
ASCE Proc, Jour Hyd, Vol 93, No HY6, Paper 5598, pp 271-279, Nov 1967. Colorado State U, Fort Collins; U S Army CRREL, Hanover, N H, 9 p, 3 fig, 3 tab, 14 ref
DESCRIPTORS-- *snow/ evaporation/ *evaporation control/ powders/ emulsions/ distribution/ laboratory tests/ melting/ *water conservation/ hexadecanols/ *monomolecular films/ alcohols/ ice/ radioactive isotopes/ octadecanol
IDENTIFIERS-- cetyl alcohol/ *long-chain alcohols/ USBR research contracts/ radiography/ evaporation pans/ autoradiography/ carbon isotopes

R202625X67A PESTICIDE POLLUTION CONTROL

WATER RESOURCES

Water pollution by pesticides began some 22 yr ago; fish kills associated with agricultural applications of chlorinated hydrocarbon insecticides were the first evidence of this new type of water pollution. The 2 principal sources of water pollution are runoff from pesticide-treated land and industrial waste discharge. Recent surveys have shown the widespread distribution of pesticides in water. Present information is fragmentary concerning effects of pesticide pollution but is sufficiently suggestive to alarm ecologists. Water quality criteria on pesticide concentration in water are reviewed. A method is presented for determining the concentration limits for organophosphate and carbamate pesticides. The procedure measures the effect of these pesticides on fish rather than determining the actual pesticide concentration in water. Measurement of the effect of chlorinated hydrocarbons in an aquatic ecosystem is much more difficult and presents problems which have not been solved. Full control of chlorinated hydrocarbon pollution is not presently attainable. Point sources of pollution can be determined by monitoring waste effluents, thus providing a first step in control of this type of pollution. Has 29 references.

R202625X67A

Nicholson, H Page
PESTICIDE POLLUTION CONTROL
Science, Vol 158, No 3803, pp 871-876, Nov 17, 1967. FWPCA, Athens, Ga, 6 p, 1 tab, 29 ref
DESCRIPTORS-- *water pollution/ *stream pollution/ fish and wildlife/ water resources/ *pollution abatement/ *water analysis/ insecticides/ sampling/ bibliographies/ fish/ ecology/ chemical analysis/ test procedures/ *water quality/ industrial waste treatment/ toxicity/ *pesticides
IDENTIFIERS-- chlorinated hydrocarbons/ organophosphorus pesticides/ gas chromatography/ *pesticide residues/ carbamate pesticides/ biological magnification/ infrared spectroscopy

R202626X67A LIVING MEMBRANES

MISCELLANEOUS

The process of biological desalination maintains a constant salt concentration necessary for the survival of living cells. The thin membranes surrounding some plant and animal cells have the ability to selectively admit or exclude certain chemicals. Reverse osmosis, one method of separating fresh water from salt water, is used by mangrove tree roots; however this is not the usual method of desalination in living cells. Animal tissues cannot sustain the high pressures needed to filter water across dense membranes. These tissues readily exchange matter between internal and external media; salt may be pumped in or out, whichever the organism requires. Biological desalination may be regarded as an active transport of salt across cell membranes. Ions and molecules are pumped against a chemical concentration gradient, seemingly in defiance of the laws of diffusion. Molecular structures located in the living membranes and powered by metabolic energy serve as pumping mechanisms. The nature of this pump is unknown; however, the process can be studied by applying nonequilibrium thermodynamics to couple diffusion with metabolic processes. Basic thermodynamics, chemical processes, and membrane structure are discussed in the development of a model for a biomechanical pump.

R202626X67A

Katchalsky, Aharon
LIVING MEMBRANES
Sci & Technol, No 72, pp 52-78, Dec 1967. Weizmann Inst of Sci, Rehovoth, Israel, 9 p, 4 fig, 1 photo, 11 ref
DESCRIPTORS-- *membranes/ cells/ thermodynamics/ ions/ saline water/ salts/ diffusion/ concentration/ biology/ entropy/ *demineralization/ salinity/ electrochemistry/ plant (botany)
IDENTIFIERS-- reverse osmosis/ *dialysis/ organisms/ metabolism/ lipids/ desalination processes/ *transport phenomenon/ chemical mechanisms/ Israel/ foreign research/ *biological membranes/ *ion transport

R202631X67A SHORT DISTANCE MEASUREMENT

A highly sensitive instrument for measuring extremely short distances has been developed at the National Bureau of Standards. A field emission ultramicrometer measures distances as small as a few hundred angstroms without physically contacting the object being measured. Calculations indicate distances of one-thousandth to one-millionth cm can be measured with a reproducibility within 10 ppm. The field emission ultramicrometer is basically an arrangement of field emission electrodes in a vacuum chamber. The electrodes are connected to a constant-current electrical circuit and a precise voltmeter indicates a voltage directly related to the spacing between the electrodes. In most applications, a field emission tip serves as 1 electrode and the surface of the sample is the other electrode. Potential applications discussed include delineating surface profiles and contours, measuring diameters of balls and holes, and a mechanical vibration sensor, a strain gage, and a differential thermal expansion cell.

R202631X67A

Young, R D
ULTRASENSITIVE MEASUREMENT OF SHORT DISTANCES
Instruments & Control Systems, Vol 40, No 11, pp 91-92, Nov 1967. Natl Bur of Standards, Boulder, Colo, 2 p, 4 fig
DESCRIPTORS-- *measurement/ *measuring instruments/ *instrumentation/ *micrometers/ vacuum/ voltmeters/ electrodes/ surfaces/ anodes/ *electronic equipment/ thermal expansion/ strain gages/ contours/ cathodes
IDENTIFIERS-- diameters/ spacing/ accuracy

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R202651X67A ECONOMICAL USE OF COMPUTERS BY MANAGEMENT

The speed of data accumulation and the computation accuracy made possible by the computer have been a boon to management by providing information quickly and in a wider variety of combinations than was ever before possible. Quick and accurate presentation of data provided by the computer is designed to give management a broader, more up-to-date data bank upon which decisions can be based. This increased amount of information lessens the areas of uncertainty, reduces the degree of risk-taking inherent in managerial decisions, and provides the basis for a higher degree of operational management not possible using previous systems of data accumulation and presentation. To obtain full value from computer investments, operating personnel must be trained in computer potentials and proper scheduling of computer time. Achieving efficient use of computer facilities is discussed, with specific procedures given for determining the necessity for computer use, program priority, and effectiveness of the computer section as a whole.

R202651X67A

Callahan, J R
MANAGEMENT OBJECTIVE: ECONOMICAL USE OF COMPUTERS
Computers & Automation, Vol 16, No 12, pp 12-17, Dec 1967. Westinghouse Elec Corp, Sunnyvale, Calif, 6 p
DESCRIPTORS-- *computers/ computer programming/ management/ economics/ data collection systems/ training/ costs/ data processing systems/ systems analysis/ professional personnel/ instruction/ planning/ *operations/ technology/ scheduling/ forecasting/ personnel requirements/ *decision making
IDENTIFIERS-- procedures/ *management planning/ problem solving/ *computer capability/ reports/ performance

R202674X67A EMPLOYEE MOTIVATION

The modern manager leads indirectly, motivating employees to assume as much responsibility, initiative, and control of their work as possible. He must create an authentic relationship with subordinates so they will understand his expectations and appreciate his consistency, thereby producing an environment in which workers can develop their full potential. To develop such an effective organization from a group of workers, the manager must: (1) have a workable theory of human behavior that gives him an understanding of psychologic laws and theories to understand, predict, and control his employees; (2) recognize individual differences and be able to evaluate each employee in order to establish a basis for that employee's self-development plan; (3) know himself and his weaknesses or limitations and consciously obtain a feedback of his effect on others; (4) learn to play varied roles in the organization to meet the demands of subordinates, coworkers, superiors, and the public; and (5) continue to learn, avoiding obsolescence in a changing industry. Workers may be motivated by their work, achievement, recognition of accomplishment, responsibility, or advancement. These motivators are all more effective than maintenance factors (salary or working conditions) that merely prevent dissatisfaction.

R202674X67A

Morgan, Henry H
EMPLOYEE MOTIVATION
Jour AWWA, Vol 59, No 11, pp 1387-1392, Nov 1967. The Psychological Corp, New York, N Y, 6 p, 7 ref
DESCRIPTORS-- management/ *leadership/ learning/ organizations/ *personnel management/ behavior (psychology)/ *motivation/ human behavior/ manpower/ environment/ efficiencies/ psychology/ responsibilities/ incentive awards/ policy matters/ *employee relations/ personnel/ wages/ supervision
IDENTIFIERS-- professional advancement/ recognition/ obsolescence/ working conditions/ professional development/ evaluation

ADMINISTRATION AND MANAGEMENT

R202690X67A FIGHTING OBSOLESCENCE

The prudent engineer is well aware that the biggest threat to his career is obsolescence. To keep himself off the roster of technical has-beens, he must devote some time every week to study. Because he will want to use his time most efficiently, the engineer should consider the advantages and disadvantages of formal course work and do-it-yourself study. The learning process will be more efficient if the following suggestions are employed: (1) Schedule regular study periods. (2) Find the best place for study. (3) Concentrate on comprehension. (4) Develop note-taking know-how. (5) Have a lesson available at all times to be reviewed at free moments throughout the day. (6) Exercise the new knowledge.

R202690X67

Nypan, Lester J
FIGHTING OBSOLESCENCE
Mach Design, Vol 39, No 30, pp 90-93, Dec 21, 1967. San Fernando Valley State College, Northridge, Calif, 4 p
DESCRIPTORS-- methodology/ management/ *engineering education/ *engineering personnel/ *education/ *training/ universities/ *learning/ concentration/ engineering/ motivation/ instruction/ professional personnel/ reasoning/ scientific personnel/ psychology
IDENTIFIERS-- obsolescence/ programmed instruction/ continuing education/ goals

CIVIL ENGINEERING (GENERAL)

R202653X67A DESIGN OF STEEL SUPPORTS FOR TUNNELS

A mathematical approach for the design and spacing of circular steel supports for tunnels is presented. An economical design should utilize the supports as reinforcement for the lining. Necessity of providing support for the sides and roof of the tunnel and type of support best suited depends upon geological formations and characteristics and properties of rock. When steel supports are proposed, the shape will depend upon the section of the excavated bore and method of excavation. A circular section may be preferred for a tunnel through soft rock. In unstable rock, the shape of the tunnel section should approach that of a full circle. A criterion for the design of lagging is included.

R202653X67

Gupta, O P
A MATHEMATICAL APPROACH TO THE DESIGN OF CIRCULAR STEEL SUPPORTS FOR TUNNELS. Water Pwr, Vol 19, No 11, pp 472-474, Nov 1967. Uttar Pradesh Irrig Dept, Lucknow, India, 3 p, 1 fig, 1 ref
DESCRIPTORS-- mathematical analysis/ design criteria/ design/ reinforcing/ *tunnel linings/ *tunnels/ *steel linings/ ribs/ loads/ rocks/ lagging/ rock mechanics/ thrust/ bending moments/ tensile stress/ foreign design practices/ plates/ *tunnel design/ tunnel pressures/ *tunnel construction
IDENTIFIERS-- India/ *tunnel supports

R202702 67A SARATOV POWERPLANT OF PRECAST CONCRETE

Design and construction technology using standard precast reinforced concrete components for standard hydraulic unit blocks of run-of-the-river powerplants has been developed in the USSR and applied to the Saratov Hydroelectric Powerplant on the Volga River. Criteria for the design were: (1) a structure composed of identical unit blocks capable of passing the design river discharge through and around the unit, (2) power factors of units equal to the highest factors of conventional units, (3) smooth hydraulic performance of water passages without energy dissipation within the block, and (4) a design so simplified that all concrete components can be fabricated for handling by production line methods. Soviet planning institutes, after investigations and changes of the 1959 specifications, finally met these criteria. Component types were reduced to 5 by simplifying the block design and using a rectangular turbine case and straight funnel-shaped (Moody) draft tube. Model tests showed that spring floods could be discharged safely through the 2 rectangular spillways in each block and that they operated to produce a smooth parallel jet flow, significantly lowering head surges. Design details of the component types and joints are given.

R202702 67A

Rudakov, V N
PRECAST REINFORCED CONCRETE STRUCTURE FOR SARATOV HYDROELECTRIC POWERPLANT
Gidrotekh Stroitel'stvo, No 2, pp 1-8, 1961. Transl from Russ, USBR Transl 652, Aug 1967, 28 p, 5 fig, 3 tab, 1 ref, append
DESCRIPTORS-- hydroelectric powerplants/ *concrete technology/ concrete dams/ *precast concrete/ structural shapes/ structural engineering/ draft tubes/ *structural design/ spillways/ rectangular conduits/ foundations/ foreign projects/ forms (concrete)/ joints/ cost comparisons/ reinforced concrete/ *dam design
IDENTIFIERS-- USSR/ Moody draft tube/ *run-of-the-river powerplant/ gate guides/ Saratov Powerplant, USSR/ Volga Cascade System, USSR/ *modular construction/ rectangular turbine cases

R202703X67A INDUS BASIN PROJECT, PAKISTAN

One of the largest civil engineering projects is the Indus Basin Project of Pakistan, being developed as the result of a treaty between Pakistan and India in 1960. Phase I of the Indus Basin Project is the Mangla Dam Project comprising Mangla, Sukian, and Jari Dams and auxiliary tunnels, canals, and diversion dams. In addition to giving a historical review of the dispute between Pakistan and India over their common water resources, a general description of the principal project works is given. Names of design and consulting engineering firms and contractors are mentioned.

R202703X67A

Anon
THE INDUS BASIN PROJECT, PAKISTAN--AN ENGINEERING SOLUTION TO A POLITICAL PROBLEM. Water & Water Engg, Vol 71, No 861, pp 441-452, Nov 1967. 12 p, 7 fig, 7 photo, 1 tab
DESCRIPTORS-- dams/ *earth dams/ projects/ hydroelectric powerplants/ dam design/ irrigation/ international compacts/ spillways/ turbines/ diversion dams/ Francis turbines/ contracts/ flood control/ flood/ wars/ siphons/ canals/ consulting engineers/ contracting/ tunnels/ costs/ civil engineering/ project planning/ foreign projects
IDENTIFIERS-- *Indus Basin, Pakistan/ Pakistan/ *Mangla Dam, Pakistan/ Jari Dam, Pakistan/ Sukian Dam, Pakistan/ Jhelum River, Pakistan/ barrages/ Tarbela Dam, Pakistan

CONCRETE TECHNOLOGY

R202640X67A CONCRETE STRENGTH AND WATER-CEMENT RATIO

Abrams rule relating the strengths of comparable concrete specimens to water-cement ratio remains as one of the fundamental relationships of concrete technology. Several aspects of the strength vs water-cement ratio relationship are examined, such as the effects of age, cement type, type o strength, and type of concrete. Analysis of experimental data indicates relative strength changes caused by a given change in water-cement ratio are greater at earlier ages than at 28-day or later ages, greater for compressive strength than for flexural or splitting strengths, greater for concrete made with Type I rather than Type III cements, and greater for normal-weight than for lightweight concrete. Formulas are presented in an attempt to quantitatively express some of the effects and improve the precision of Abrams formula. Has 38 references.

R202640X67

Popovics, Sandor
FACTORS AFFECTING THE RELATIONSHIP BETWEEN STRENGTH AND WATER-CEMENT RATIO
Matls Res & Stds, Vol 7, No 12, pp 527-534, Dec 1967. Auburn U, Ala, 8 p, 7 fig, 3 tab, 38 ref
DESCRIPTORS-- *water cement ratio/ *concrete/ *concrete technology/ curve fitting/ portland cement/ *concrete mixes/ compressive strength/ flexural strength/ bibliographies/ splitting tensile strength/ experimental data/ concrete testing/ mortars/ mechanical properties/ laboratory tests
IDENTIFIERS-- empirical equations/ concrete properties/ lightweight concretes

R202644X67A ULTIMATE STRENGTH OF CONCRETE

Strength of concrete under a sustained load is less than the strength determined by short-time tests. To determine the safety of a structure, the maximum load that safely can be sustained permanently must be found. A brief review is given of direct and indirect methods for determining the sustained load or true ultimate strength of concrete. Direct methods test specimens under different high sustained loads over a long period of time; various investigators have reported true ultimate strength ranges from about 70 to 90% of ultimate strength. Indirect methods of estimating true ultimate strength include the creep test method, volumetric strain method, microcracking observations, and log stress-log strain plots. Indirect methods reviewed show a similar range for true ultimate strength expressed as a percentage of ultimate strength; the authors' experimental work with indirect methods is included. Direct methods of evaluating true ultimate strength are more reliable, but indirect methods involve less time. A combination of several indirect methods is recommended to increase reliability. Has 26 references.

R202644X67

Desayi, Prakash and Viswanatha, C S
TRUE ULTIMATE STRENGTH OF PLAIN CONCRETE
Rilem Bull, No 36, pp 163-173, Sept 1967. Indian Inst of Sci, Bangalore, 11 p, 8 fig, 4 tab, 26 ref
DESCRIPTORS-- *ultimate loads/ ultimate tensile strength/ *concrete/ creep *concrete testing/ bibliographies/ *concrete technology/ tensile strength strength of materials/ compressive strength/ laboratory tests/ volume/ reviews/ strain/ stress-strain curves/ loads/ safety/ loading time
IDENTIFIERS-- *sustained loads/ microcracks/ foreign testing/ India/ *ultimate strength

R202700 67A CONCRETE PROPERTIES AT HIGH TEMPERATURES

CONCRETE TECHNOLOGY

Laboratory tests were conducted to determine drying effects on structural concrete exposed to elevated temperature conditions existing in a flash-evaporation water desalting plant. Creep, compressive strength, and modulus of elasticity were measured on concrete dried at temperatures of 73, 130, 180, 230, and 290 deg F over a period of 6 mo. Results show creep at 290 deg F is about 5 times the creep at 73 deg F. Compressive strength is lowest at 180 deg F; elastic modulus is lowest at 230 deg F and about one-half the modulus at 73 deg F. Variations in concrete properties indicate that possible changes in the composition of concrete occur at temperatures above 180 deg F. Data on strength and moduli changes during storage, strain of unloaded concrete specimens, and weight loss at the different temperatures are reported.

R202700 67A

Hickey, Ken B
CREEP, STRENGTH, AND ELASTICITY OF CONCRETE AT ELEVATED TEMPERATURES
USBR Lab Rept C-1257, Conc & Struc Br, Dec 1967. Bureau of Reclamation, Denver, Colo, 19 p, 7 fig, 6 tab
DESCRIPTORS-- *creep/ *concrete/ elasticity/ strength of materials/ strain/ *high temperature research/ *concrete technology/ deformation/ mechanical properties/ concrete structures/ *compressive strength/ *elasticity modulus/ materials testing/ test procedures/ temperature/ demineralization/ *drying/ dry weight/ *concrete testing/ expansion/ shrinkage
IDENTIFIERS-- sustained loads/ flash evaporators/ weight loss/ high temperature

R202695 67A CANAL EXCAVATION BY EXPLOSIVES

CONSTRUCTION

A 42-km reach of the Amu-Bukharsk Canal and longer reaches of collector drains and feeder canals were excavated by conventional explosives in Uzbek SSR to test the theory and technology of using explosive energy to construct such designed structures. Results of excavating by mass explosions to a design depth from 6.5 to 10 m showed the feasibility of this method. The material excavated varied from porphyrites and sandstones to loams and alluviums; the explosives were TNT, ammonium nitrate, and Igdanit (ammonium nitrate and diesel oil). The costs of excavating soil using the first 2 explosives were about the same as the cost of excavating with conventional equipment, but the cost using Igdanit was 28 to 30% less. Each particular project, however, must be studied carefully as to geology, hydrogeology, and physical-mechanical properties of the soil involved to determine the best method. Evaluating explosive excavation for cost alone fails to consider: (1) shortened construction time, (2) use of simpler machines not requiring power sources or extensions of main roads, and (3) increased productivity of conventional excavating equipment when completing the canal section. Methods of placing the charges, spacing, and amount of explosives used are given.

R202695 67A

Chevkin, A I
EXPERIENCE IN CANAL CONSTRUCTION USING EXCAVATION BY EXPLOSIVES
Gidrotekhnika i Melioratsiia, No 1, pp 64-69, 1967. Transl from Russ, USBR Transl 730, Aug 1967, 14 p, 3 fig, 4 tab
DESCRIPTORS-- *canals/ explosions/ *explosives/ *excavation/ foreign projects/ charges (explosives)/ locations/ drill holes/ cost comparisons/ earth materials/ earthworks/ *canal design/ methodology/ *cratering/ craters/ earth handling equipment/ efficiencies
IDENTIFIERS-- USSR/ TNT/ depth of burst/ spacing/ Uzbek SSR/ Igdanit/ depth/ *explosive excavation/ ammonium nitrate/ spaced charges/ *canal construction

R202705 67A SUBWAY CONSTRUCTION IN JAPAN

The major cities of Japan are constructing subways and rapid transit rai roads as the first measure to solve the traffic problem. A description subway construction methods used in Japan is given. The methods include opencut, cut and cover, noncovered opencut, shield, caisson, freezing, t ICOS method, and trenching. Details are given on the construction of th Ginza Station Complex and the Tokyo subway. Waterproofing linings, unde ground crossings of rail lines, under river crossings, and underground c crete structures are discussed. The great expansion of subway systems i requiring such progress in technology that the construction methods described are already becoming obsolete.

R202705

Mimino, Shin and Irie, Hirato
SUBWAY CONSTRUCTION IN JAPAN
Civ Engg in Japan, pp 21-44, Aug 1967. Teito Rapid Transit Authority, Tokyo, Japan, 24 p, 26 fig, 17 photo, 4 tab
DESCRIPTORS-- *tunnel construction/ tunnel design/ tunnel linings/ city planning/ *tunneling/ *tunnels/ *underground structures/ foreign project trenches/ caissons/ freezing/ *rapid transit systems/ shields/ railroads transportation/ foreign construction/ construction
IDENTIFIERS-- *subways/ Japan/ Tokyo subway, Japan/ ICOS/ underground openings

R202706 67A NEW SHIMIZU TUNNEL

In order to meet the increased transportation capacity demand on the Jo railroad line in Japan, the 13.49-km-long New Shimizu tunnel was constr ted under Mt Tanigawa and approximately parallel to and some 60 m below existing single-track Shimizu tunnel. Traffic demands required that th tunnel be completed within 4 yr. The tunnel was divided into 3 section each approximately 5 km long. Because of complicated geology and slow neling conditions, each section required 4 yr for completion. Selectio the tunnel route and geological conditions are described. The fullface tunneling method was selected as the most efficient procedure. Constru tion progress and equipment are discussed. Technical problems encounte included inaccuracies in geological surveying, groung water, rockbursts and encounters with hot springs and resulting complaints from hot sprin resorts in the area.

R202706

Ikehara, Takeichiro
CONSTRUCTION OF THE NEW SHIMIZU TUNNEL
Civ Engg in Japan, pp 9-20, Aug 1967. Japanese Natl Railways, 12 p, 5 2 tab
DESCRIPTORS-- *tunnel construction/ tunnel linings/ *tunneling/ *tunnel springs (water)/ drainage/ engineering geology/ geologic investigations seismic waves/ temperature/ ground water/ rocks/ muck/ costs/ railroads foreign construction/ construction/ seismic investigations
IDENTIFIERS-- New Shimizu tunnel, Japan/ Japan/ hot springs/ rockbursts tunnel supports

R202688 67A SPILLWAY TRAINING WALL DAMAGE AT BHAKRA

DAMS AND HYDRAULIC STRUCTURES

Flood water overflow destroyed a portion of the center training wall of the Bhakra Dam spillway in August 1958. The center training wall (20 ft thick at the base and 5 ft thick at the top) had been constructed to facilitate spillway repairs and designed to withstand the maximum head that would be experienced while repairs were in progress. After the loss of part of the wall, hydraulic model studies were made to determine the cause of the failure. Results showed that turbulence occurring in the hydraulic jump region, accompanied by high vibrations near resonant frequency and rapid differential pressures from 20 ft on one side of the wall to 20 ft on the opposite side, caused the collapse. Pressure cells and an oscillograph were used to measure the instantaneous fluctuations of pressure on the two sides of the wall for various flood flows.

R202688 67A

Uppal, H L; Gulati, T D; Sharma, B A D
A STUDY OF CAUSES OF DAMAGE TO THE CENTRAL TRAINING WALL BHAKRA DAM SPILLWAY. Jour of Hyd Res, Vol 5, No 3, pp 209-224, 1967. Irrig & Pwr Res Inst, Punjab, India, 16 p, 8 fig, 2 tab
DESCRIPTORS-- *training walls/ *damages/ concrete dams/ hydraulic models/ *spillways/ piers/ models/ piezometers/ oscillographs/ turbulent flow/ turbulence/ hydraulic jumps/ flow/ pressures/ pressure measuring equip/ *failure (mechanics)/ vibrations/ nappe/ water surface profiles/ eddies/ hydraulics/ foreign design practices/ air entrainment
IDENTIFIERS-- *Bhakra Dam, India/ *differential pressure/ flow patterns/ India/ foreign research

R202636 67A RADIATION LOGS IN GROUND WATER HYDROLOGY

DRAINAGE AND GROUND WATER

Inexpensive portable radiation logging equipment has been developed in connection with a general research project on the application of borehole geophysics in ground water hydrology. Data can be obtained on source, velocity, and chemical quality of ground water; location, extent, geometry, bulk density, porosity, permeability, and specific yield of aquifers and associated strata; and position of casings, casing collars, leaks, perforations, and cement. The radiation logs employed include natural gamma, gamma-gamma, neutron-gamma, neutron epithermal-neutron, and radioactive tracer. Radioisotopes used were cobalt-60, plutonium-239, americium-241, and iodine-131. Typical radiation logs obtained by various techniques are described and examples given of applications of radiation logging to ground water investigations. Applications cited are studies of perched water in basaltic rocks and associated sedimentary strata; porosity, moisture content, and position of zones into which water was injected in volcanic tuff; position of the interface between brine and fresh water in fine-grained carbonate rocks and associated fine clastic rocks; interpretation of porosity from a neutron log; and location by means of a radioactive tracer of the more permeable fracture zones in a well penetrating crystalline rock.

R202636 67A

Keys, W Scott
THE APPLICATION OF RADIATION LOGS TO GROUNDWATER HYDROLOGY
Proc, Intl Atomic Energy Agency Symp on Isotopes in Hydrol, Vienna, Austria, pp 477-488, 1967. USGS, Denver, Colo, 12 p, 4 fig, 6 ref, disc
DESCRIPTORS-- *ground water/ *boreholes/ gamma rays/ *logging/ geophysics/ *radioactive isotopes/ groundwater geology/ neutron counters/ aquifers/ *tracers/ cobalt/ perched water table/ groundwater flow/ wells/ injection/ density/ *drill holes/ porosity/ well casings/ geologic investigations
IDENTIFIERS-- *radiation measuring equip/ iodine/ americium/ gamma probes/ radiation detectors/ cobalt isotopes/ plutonium isotopes/ iodine isotopes/ americium isotopes

R202668X67A WELL DESIGN AND ELECTRIC ANALOG MODELS

An analysis was made of the characteristics of pumped wells appearing at pumped well junctions of electric analog models as a result of using clas ical design equations. A comparison was made between the flow properties adjacent to pumped well junctions for standard and modified vector volume of resistors. The comparison indicated that a pumped well on the analog model has a radius given by the grid interval divided by 4.810 when the resistors have been designed with the standard vector-volume equations. Computed practical sustained yields of aquifers are invalid if obtained from electric analog model studies which do not consider characteristics of the pumped wells. Because the normal radii of pumped wells are much less than the radii indicated above, significant error occurs in the draw down at pumped wells on the model. Methods are outlined for designing partial penetrations, gravel pack designs, and turbulence loss constants into the analog model pumped wells having differing radii. These methods can be used to design pumped wells into electric analog models that have the same characteristics of existing or contemplated wells.

R202668X

Prickett, T A
DESIGNING PUMPED WELL CHARACTERISTICS INTO ELECTRIC ANALOG MODELS
Ground Water, Vol 5, No 4, pp 38-46, Oct 1967. Illinois State Water Survey, Urbana, 9 p, 9 fig, 1 tab, 11 ref
DESCRIPTORS-- *electric analogs/ *wells/ models/ *ground water/ aquifers/ two-dimensional/ water yield/ well screens/ well casings/ oscilloscopes/ electric potential/ ohmmeters/ analogs/ characteristics/ gravels/ water table/ electrical resistivity/ drawdown/ errors/ model tests
IDENTIFIERS-- pumping

R202698X67A GROUND WATER IN A TWO-LAYER POROUS MEDIUM

Methods used by the Jaroslav Cerni Institute Hydraulic Laboratory of Yugoslavia to solve ground water problems and analyze water balance para eters are described. Particular attention is given to the method of stu ing ground water regimes in a 2-layer porous medium using the limiting anisotropy principle. The 2-layer porous medium is considered as over- laying an impervious substratum with the lower layer acting as the aquif and the upper layer being less permeable. Flow in the lower layer is th under pressure and considered to be horizontal, while flow in the upper less permeable layer is vertical. Solutions for various problems of ste and unsteady ground water flow in 2- and 3-layer media, ground water flo in riverbed plains, and electric analog applications to ground water pro lems are discussed. Has 25 references.

R202698X

Vukovic, Milan
GROUNDWATER IN A TWO-LAYER POROUS MEDIUM
Trans, Inst Vodoprivredu, Jaroslav Cerni, Belgrade, Yugoslavia, Vol 13, No 39, pp 5-41, 1966. 40 p, 25 fig, 6 tab, 25 ref
DESCRIPTORS-- *ground water/ *porous materials/ *groundwater flow/ elect analogs/ embankments/ rivers/ bibliographies/ water balance/ differentia equations/ anisotropy/ infiltration/ permeability/ *aquifers/ *water tab drainage/ models/ model tests/ unsteady flow
IDENTIFIERS-- *porous media/ Yugoslavia/ barriers/ drains/ equations/ inundation/ finite element method/ formulas/ open drains/ two-part aqui

R202654X67A COMPUTER METHODS OF NETWORK ANALYSIS

Influence of the computer on network theory and the method of solving circuit design problems is discussed. Properties of linear graphs are reviewed, and a matrix formulation of the network problem is described. In addition to the classical mesh, node, and cutset methods, a mixed method of analysis is considered which is applicable to d-c, a-c, and transient problems. Numerical methods of solving linear and nonlinear d-c network problems are discussed, and a new approach to a-c analysis, using the mixed method and a numerical solution of the matrix eigenvalue problem, is given. Extension of this method to the transient analysis of linear networks is explained. Instability in the numerical integration of differential equations is analyzed, and several means of solving the problem are outlined. Has 50 references.

R202654X67A

Branin, Franklin H, Jr
COMPUTER METHODS OF NETWORK ANALYSIS
Proc of IEEE,Vol 55, No 11, pp 1787-1801, Nov 1967. IBM Corp, Kingston, N Y, 15 p, 10 fig, 1 tab, 50 ref
DESCRIPTORS-- *digital computers/ *analog computers/ design/ circuits/ matrix algebra/ *electrical networks/ theory/ bibliographies/ algorithm/ electrical engineering/ differential equations/ computation/ mathematical analysis/ integrals/ computers/ analysis/ computer programming
IDENTIFIERS-- *network analysis/ problem solving/ interconnected systems/ eigenvalues

R202656X67A REAL & REACTIVE POWER--ECONOMIC DISPATCH

Transmission line losses have become increasingly important in the development of large integrated power systems. The authors discuss an economic schedule for real power generation obtained by a Lagrangian method and allocation of reactive power generation determined by a gradient method. Alternate real and reactive power requirements for economic system operation are computed until the total production cost is minimized within the limitations imposed by system constraints. Repeated solutions of the network equations are used to incorporate the effects of transmission losses in lieu of a precalculated transmission loss formula. A computer program provides a means to determine optimum use of available real and reactive power generation and plan economically for future requirements. Computer flow charts for real and reactive power dispatch and a simplified flow chart for economic allocation of real and reactive power are included. Results of a sample system calculation are tabulated. The method presented can be used in planning studies to determine operating costs for present and proposed generation and transmission facilities.

R202656X67A

Dopazo, J F; Klitin, O A; Stagg, G W; Watson, M
AN OPTIMIZATION TECHNIQUE FOR REAL AND REACTIVE POWER ALLOCATION
Proc of IEEE, Vol 55, No 11, pp 1877-1885, Nov 1967. American Elec Pwr Service Corp, N Y, N Y, 9 p, 8 fig, 5 tab, 10 ref
DESCRIPTORS-- transmission lines/ losses/ *electric power costs/ computers/ economics/ *electric power production/ computer programming/ calculations/ scheduling/ bus (electrical)/ charts/ *power system operations/ optimum use/ flow diagrams/ transmission (electrical)
IDENTIFIERS-- interconnected systems/ reactive loads/ *power dispatching/ *operating costs/ Lagrangian Multiplier Meth/ power grids

R202658X67A NONDESTRUCTIVE TESTING OF INSULATION

Large savings in generator insulation maintenance and replacement costs can be realized through the use of modern nondestructive insulation testing techniques. One such test involves subjecting the insulation system to a high direct voltage (HDV), with measurement of the resulting current as a function of time and voltage. A new concept of HDV testing and the associated test equipment is presented. This testing concept produces more reliable and useful data on the condition of the insulation system. The new system is designed around a high-stability HDV supply which applies the test voltage at a predetermined continuous rate of rise, thereby permitting accurate measurement of small increments of specimen current. Emphasis is placed on the proper use of guard circuits and high stability of the power supply to eliminate misleading results and permit nondestructive detection of fault paths. Test procedures and the new test equipment are discussed and results of tests on a 76-mva, 13.8-kv generator given.

R202658X67A

McHenry, Bruce L
GENERATOR INSULATION TESTING BY CONTINUOUS TIME-FUNCTION APPLICATION OF DIRECT VOLTAGE. IEEE Trans, Vol PAS-86, No 11, pp 1329-1333, Nov 1967. Ontario Hydro, Toronto, Canada, 5 p, 8 fig, 3 ref, disc
DESCRIPTORS-- *electric insulation/ *nondestructive tests/ *maintenance/ replacing/ replacement costs/ test procedures/ test facilities/ absorption/ direct currents/ extra high voltage/ faults (electrical)/ power O&M/ costs/ electrical coronas/ electric currents
IDENTIFIERS-- *stators/ flashover/ *electrical insulation tests/ Canada/ cost savings/ foreign testing

R202659X67A DAMPER FOR GALLOPING CONDUCTOR WAVES

Standing wave effects of galloping conductor motion are analyzed in terms of parameters which may be evaluated in accordance with procedures for dealing with analogous steady-state and transient phenomena in elementary electrical circuits. These parameters are defined and used to determine conditions which must be satisfied to assure completely damped galloping conductor motion. A method is proposed for including the required friction resistance in a practical damper. An illustrative application is described and data are presented suggesting the possibility of achieving sufficient control with only 1 damper per conductor mile of overhead transmission line. The spring washer-type friction resistance damper is compact, trouble-free, immune to atmospheric environment, can be assembled from rugged commercially available components, and presents no unfamiliar engineering principles.

R202659X67

Kidder, Allan H
PROPOSED FRICTION DAMPER FOR GALLOPING CONDUCTOR WAVES
IEEE Trans, Vol PAS-86, No 11, pp 1368-1374, Nov 1967. Philadelphia Elec Co, Pa, 7 p, 3 fig, 1 tab, 3 ref, append, disc
DESCRIPTORS-- *transmission lines/ *dampers/ friction/ motion/ energy/ electric analogs/ *mechanical waves/ dynamics/ energy absorption/ analysis frequency/ elasticity modulus/ tension/ hysteresis/ wave velocity/ *electric cables
IDENTIFIERS-- *galloping conductors/ traveling waves/ harmonics/ *electric conductors

R202660X67A STAGED TESTS ON THE TVA-SCEC 500-KV LINE

A comprehensive series of field tests was made on the Tennessee Valley Authority-South Central Electric Companies' (TVA-SCEC) 160-mi, 500-kv interconnecting line and associated terminal equipment. The tests included energizing at controlled points on the voltage wave and deenergizing a shunt-reactor compensated line with a transient voltage limiting breaker, switching a line and 1200-mva transformer with a 161-kv transient voltage limiting breaker, applying solid persistent and transient arcing faults to a loaded line, and high-speed reclosing after fault clearing. High-speed motion pictures were combined with oscillograms to obtain and relate data. Methods, instrumentation, and results are given. These tests verified the validity of criteria used in line and terminal equipment design and yielded helpful information for planning future 500-kv facilities.

R202660X67A

Newsom, R N; Nickelson, S B; Toler, R W; Merritt, M S, et al
STAGED TESTS ON THE TVA-SCEC 500-KV INTERCONNECTION BETWEEN JOHNSONVILLE AND WEST MEMPHIS. IEEE Trans, Vol PAS-86, No 11, pp 1389-1399, Nov 1967. Commonwealth Assoc, Inc, Jackson, Mich; Arkansas Pwr & Light Co, Pine Bluff; TVA, Chattanooga, Tenn, 11 p, 9 fig, 5 ref, disc
DESCRIPTORS-- *extra high voltage/ alternating currents/ instrumentation/ *field tests/ transmission lines/ substations (electrical)/ electric power/ faults (electrical)/ circuit breakers/ electric relays/ performance tests/ electrical coronas/ bundled conductors/ design criteria/ oscillographs/ power transformers/ electrical equipment/ motion pictures
IDENTIFIERS-- line switching/ *switching surges/ interconnected systems/ lightning arresters

R202663X67A DYNAMIC BEHAVIOR OF A HYDROGENERATOR

Completion of the hvdc transmission line between Benmore, South Island, and Haywards, North Island, New Zealand, has provided an opportunity to make comprehensive transient loading tests on the Benmore hydroelectric generators using precise load control. Results of field tests are reported. A linearized model of the generating units is derived and analog-computer test results are compared with field tests for various loading conditions and a range of governor settings. Methods of calibrating the governor settings are described, and the effect of possible governor nonlinearity on dynamic response is discussed. The long-range objective of these studies is to improve governing systems by better understanding factors controlling transient response of hydrogenerators.

R202663X67A

Woodward, J L and Hitchcock, H C
THE DYNAMIC BEHAVIOR OF A HYDROGENERATING SET
Paper 67-WA/FE-41, ASME Winter Ann Mtg & Energy Sys Expo, Pittsburgh, Pa, Nov 1967. U of Adelaide, Australia; Wellington Elec Dept, N Z, 13 p, 17 fig, 4 tab, 11 ref
DESCRIPTORS-- hydroelectric powerplants/ *electric generators/ *electrical stability/ Francis turbines/ *speed regulators/ disturbances/ transmission (electrical)/ electric power/ extra high voltage/ direct currents/ analog computers/ *field tests/ mathematical analysis
IDENTIFIERS-- outages/ interconnected systems/ transient stability/ load rejection/ *loading tests/ governors (hydraulic)/ foreign testing/ New Zealand

R202669X67A BITSCH HYDROELECTRIC SCHEME

The Bitsch Hydroelectric Scheme is the first stage and principal element the Haut-Valais Development in the Rhone Valley of Southern Switzerland. All water gathered in the lower and upper levels of the entire developme eventually will pass through the turbines at the Bitsch Hydroplant. Wat from all right-bank tributaries of the upper Rhone Valley will be diverte by a catchment scheme to the Gebidem Reservoir formed by a double-curvat arch dam on the Massa River at Gebidem. These waters are of glacial ori and heavily laden with silt, sand, and gravels; therefore, special atten tion was given to protection of the reservoir against silting. Several schemes of desilting were considered, but the construction of 2 flushing sluices through the dam was the most economical and satisfactorily remov deposits from the reservoir. The Haut-Valais Hydroelectric Development reviewed, and details of the Bitsch underground powerplant are given. M chanical and electrical contractors furnishing equipment for the powerpl are listed.

R202669X

Stutz, Roman O
THE BITSCH HYDROELECTRIC SCHEME
Water Pwr, Vol 19, No 11 & 12, pp 445-454 & 487-493, Nov & Dec 1967. 17
19 fig, 2 tab
DESCRIPTORS-- electric power production/ project planning/ arch dams/ *hydroelectric power/ hydroelectric powerplants/ sedimentation/ economic *sediment control/ glaciers/ runoff/ foreign projects/ pressure tunnels/ foreign construction/ underground powerplants/ sluices/ tunnels/ canals/ electrical equipment/ reservoirs/ Pelton turbines/ mechanical equipment/ switchyards (electrical)/ construction/ suspended solids
IDENTIFIERS-- Switzerland/ Rhone Valley, Switzerland/ catchments/ Gebide Resvr, Switzerland/ Bitsch Scheme, Switzerland

R202671X67A PUMPED STORAGE IN GERMANY

Existing pumped-storage installations in the German Federal Republic are surveyed and a study of future installations discussed. The future of pumped storage in the German power industry is examined and importance pumped storage as instantaneous reserve generation is stressed. Startin times for pumps and turbines is very short (about 70 sec), and a fully automatic changeover from pumping to generation is about 150 sec. Pumpe storage plants are being used to furnish night load to thermal plants, thus eliminating daily starting and shutdown with associated heat losses At the same time, these pumped-storage installations offer short-notice reserve capacity generation for peaking requirements. The technical development of pumped storage as it relates to conventional hydroelectri practice is discussed. Has 73 references.

R202671

Frohnholzer, Josef
PUMPED STORAGE IN GERMANY
Water Pwr, Vol 19, No 11 & 12, pp 458-462 & 507-514, Nov & Dec 1967.
Bayerische Wasserkraftwerke, A G, Munich, W Germany, 13 p, 15 fig, 3 ta
73 ref
DESCRIPTORS-- *pumped storage/ *pump turbines/ peaking capacities/ elec power/ *electric power production/ peak power/ thermal powerplants/ pow system operations/ hydroelectric powerplants/ efficiencies/ constructio costs/ bibliographies/ foreign design practices/ economics/ reservoirs/ geology/ underground powerplants
IDENTIFIERS-- German Fed Republic/ interconnected systems/ operating co

R202683X67A MULTIPLEXING FOR DATA ACQUISITION

Input for data acquisition and computer control systems is usually in the form of electrical voltage measurements. The signal levels almost always require some form of conditioning or amplification. Individual sets of signal amplification-conditioning components for each data input channel are not economically feasible, so a time-sharing system is normally used to sequentially switch various input signals into a common channel. These switching networks are called multiplexers if the time-sequencing control circuitry is external or scanners if the control is self-contained. Multiplexer switching components are surveyed to provide a basic understanding and an awareness of characteristics which must be considered in the choice of a multiplexing scheme. The operation and inherent characteristics of electromechanical and solid-state switchers are described. Electromechanical reed and mercury relay devices are well suited for general multiplexing applications. The solid-state insulated gate field-effect transistor has advantages in its great speed and small size and is the best available device for high-speed analog data multiplexing.

R202683X67A

Marks, Richard H
MULTIPLEXING FOR DATA ACQUISITION
Res/Dvlpmt, Vol 18, No 12, pp 24-29, Dec 1967. C P Clare & Co, Chicago, Ill, 6 p, 10 fig
DESCRIPTORS-- *data collection systems/ *switching circuits/ *electronic equipment/ *instrumentation/ electronics/ transistors/ analogs/ computer systems components/ computers/ control systems/ electric relays/ electrical engineering/ electric switches/ data transmission systems/ design criteria/ electrical properties
IDENTIFIERS-- *multiplexing/ relay systems/ scanning

R202685X67A EDUCATION OF POWER SYSTEM ENGINEERS

Need of the power utilities for competent engineers with specialized training is alarmingly acute. The growing complexity of the industry requires an increased influx of highly trained engineers on the BS, MS, and PhD levels. These men must be specialists in the power field. Ironically, the number of engineers available to the electric utilities is declining rapidly. Few colleges and universities offer specialized courses in the power field. As a result, few graduates are either interested in or qualified to enter the power industry. The prognosis looks grim unless money can be found to strengthen university curricula in power system engineering. Because private utilities will be the actual benefactors of such an improved program, they would be the logical donors of the needed funds. Has 17 references.

R202685X67A

Erdelyi, E A and Barnes, F S
COOPERATION OF UNIVERSITIES AND UTILITIES FOR THE EDUCATION OF POWER-SYSTEM ENGINEERS. IEEE Spectrum, Vol 4, No 12, pp 71-82, Dec 1967. U of Colorado, Boulder, 12 p, 17 ref, disc
DESCRIPTORS-- *electric power/ power system operations/ bibliographies/ engineering personnel/ *engineering education/ industries/ *education/ training/ professional personnel/ *universities/ *electrical engineering/ *public utilities/ learning/ schools/ costs
IDENTIFIERS-- cooperation/ obsolescence/ continuing education/ *electric utilities

R202699 67A TRANSMISSION LINE LOSS METER

Heretofore no acceptable method of metering transmission line losses has been established. The installation of metering facilities at each end of a line, using the difference between energy input and energy output, is inherently inaccurate because it requires using the difference between large quantities of similar magnitude, each of which may be in error. A method of metering transmission line losses from one end by using a loss meter is described. The principle of operation involves inserting a miniature representation (model) of the equivalent pi for the transmission line at one terminal, and by application of the proper voltage and current, the losses measured in the model are proportional to the line losses. This method is particularly useful where the point of delivery and metering equipment are at opposite ends of the line and where an adjustment in billing must be made to compensate for transmission losses. The loss meter method provides data useful in administering power contracts and in system operation.

R202699 67

USBR Elec & Elec Pwr Branches
TRANSMISSION LINE LOSS METER
USBR Lab Rept EP-23, Elec Pwr Br & Elec Br, Sept 1967. Bureau of Reclamation, Denver, Colo, 35 p, 8 fig, 4 tab, 4 append
DESCRIPTORS-- alternating currents/ digital computers/ electric analogs/ electrical equipment/ electric potential/ electric terminals/ field tests/ *energy losses/ indirect method/ resistors/ measurement/ *metering/ model tests/ *models/ *scale/ *transmission lines/ wattmeters/ transmission (electrical)
IDENTIFIERS-- accuracy/ *power losses/ instrument transformers

R202704X67A PUMPED STORAGE PLANT SELECTION

Tumut 3, the largest project in the Australian Snowy Mountains Scheme, will have a generating capacity of 1500 mw and a pumping capacity of 500 mw. Investigation of the most suitable form of plant resulted in the adoption of 250-mw generating units and, to meet the pumping requirements, a choice between three 167-mw direct-coupled pumps and two 250-mw reversible pump-turbines. Investigations and considerations leading to the final selection of the former are described, and the need for critical appraisal of all factors affecting a pumped-storage scheme is emphasized, especially where generating and pumping requirements are not equal and characteristics of the contemplated plant are beyond the current limit of world practice.

R202704X67

Bray, A N G and Frost, A C H
THE SELECTION OF PUMPED STORAGE PLANT, WITH PARTICULAR REFERENCE TO TUMUT PROJECT. Inst of Engrs, Austrl, Vol 39, No 9, pp 139-150, Sept 1967. Snowy Mtns Hydro-Elec Authority, Australia, 12 p, 7 fig, 1 ref, disc
DESCRIPTORS-- *pumped storage/ *hydroelectric powerplants/ *pump turbines/ hydroelectric power/ pumps/ pumping plants/ pipelines/ model tests/ excitation/ power transformers/ hydraulic gates and valves/ *Francis turbines/ costs/ cost comparisons/ design criteria/ hydraulic turbines/ electric generators
IDENTIFIERS-- *Tumut Power Sta, Australia/ Snowy Mtns Hydro-Elect Auth/ Australia/ switchgear/ reversible turbines/ starting/ comparative studies/ pumping

R202707 67A INSULATING OIL DIELECTRIC STRENGTH AT EHV

ELECTRICAL ENGINEERING

The necessity of keeping the weight of ehv transformers to a minimum requires insulating oil of higher purity with better dielectric strength. Insulating oil measurements extended to voltages with peak values of up to 1500 kv, with electrode arrangements in the forms of plate-plate, tube-plate, and coaxial cylinders, are discussed. The withstand or mean breakdown values are given for power-frequency voltage, and the 50% breakdown values are given for standard and switching surge waves, together with the scatter ranges. Electric strength is less dependent on the purity of the oil with standard impulses than with power-frequency voltage. With switching surge voltages, breakdown value is dependent on the rise time; its comparatively inconspicuous minimum value lies in the inhomogeneous field with rise times between 100 and 1000 microseconds, depending on the electrode configuration.

R202707 67A

Maier, G
THE ELECTRIC STRENGTH OF INSULATING OIL WITH POWER-FREQUENCY VOLTAGE, SWITCHING SURGES AND STANDARD IMPULSES. Brown Boveri Rev, Vol 54, No 7, pp 368-376, July 1967. 9 p, 15 fig, 4 ref
DESCRIPTORS-- extra high voltage/ *power transformers/ *dielectrics/ test procedures/ *transformer oils/ *electric insulation/ alternating currents/ contamination/ electrodes/ electric fields/ impulse tests (electrical)/ electric potential/ electric currents/ electric arcs/ electrical equipment/ electrical properties
IDENTIFIERS-- *insulating oil/ insulation/ switching surges/ flashover/ foreign testing/ Switzerland

R202652X67A PRESSURE DISTRIBUTION IN FOUNDATIONS

FOUNDATIONS

A method is presented for computing vertical displacement and pressure at any point in a foundation material. Foundation settlement or deflection in a foundation material is generally a summation of 4 effects: elastic deformation, compaction of the material, plastic flow, and reduction of pore water. All of these factors affect the deflection in a foundation to some degree, but the effect of 1 is generally predominant, depending on the material present. Pressure distribution in a foundation must be known before the elastic deformation can be evaluated. Tests and experience have shown that the Boussinesq equation gives sufficiently accurate pressure distribution in foundations under a uniformly loaded circular area. The method presented is an application of the Boussinesq equation. Two example problems illustrating the application of the method are discussed.

R202652X67A

Sollid, Erik
PRESSURE DISTRIBUTION IN FOUNDATIONS
Water Pwr, Vol 19, No 11, pp 469-471, Nov 1967. 3 p, 5 fig, 3 tab
DESCRIPTORS-- *foundations/ *pressure distribution/ *elastic deformation/ homogeneity/ isotropy/ vertical loads/ loads/ mathematical analysis/ numerical method/ pressures/ Poisson ratio/ elasticity modulus/ soils/ settlement/ foreign design practices/ flexible foundations
IDENTIFIERS-- *Boussinesq equation

FOUNDATIONS

R202686X67A PILE AND CAISSON FOUNDATIONS

Useful details of piles and cylindrical caissons presently used in the U S to resist axial loads and a general description of the construction equipment and procedures used to install these units are presented. Methods used to pay for these foundation types are discussed. Selecting a proper type of foundation requires: (1) reliable subsurface information, including acceptable soil samples; (2) knowledge of forces to be resisted at a fixed elevation; and (3) knowledge of costs of competitive types of foundations or a reliable source for these costs. Piles or caissons should be used only when they are needed and prove to be more economical than other foundation types. Primarily, piles are made of wood, concrete, metal, or a combination thereof. Piles of different materials or combinations of materials may be necessary for an individual requirement, since an all-purpose pile does not exist. Discussion of caissons is limited to cylindrical excavations (with or without an enlarged base) made on land and filled with concrete to plan cutoff elevation.

R202686X67A

Mohr, H A
PILE AND CAISSON FOUNDATIONS
Jour of Boston Soc Civ Engrs, Vol 54, No 3, pp 149-194, July 1967. 46 p, 21 fig
DESCRIPTORS-- *piles/ *pile driving/ *pile foundations/ pile spacing/ wood piles/ pile bearing capacities/ cast-in-place structures/ *caissons/ *foundations/ casings/ reinforced concrete/ prestressed concrete/ precast concrete/ composite structures/ payment/ materials
IDENTIFIERS-- pile caps/ pile-driving formulas/ jetting/ steel piles/ concrete piles/ construction methods/ belled footings/ cast-in-place piles

GEOLOGY AND GEOPHYSICS

R202661 67A ORIENTED DRILL CORES

Oriented drill cores obtained with the Christensen-Hugel Orienting Barrel were used to determine subsurface foundation conditions at Oso Pumping Plant and Pyramid Powerplant, California Aqueduct Project. The orienting core barrel is similar to conventional NX diamond core barrels but has 3 knives mounted at the bottom of the inner barrel and a surveying instrument attached to the top of the core. The knives cut continuous grooves in the core, permitting orientation by the surveying instrument. Operation of the orienting core barrel is described and applications at Oso and Pyramid plants are discussed. The orienting core barrel and borehole TV camera were used at both sites. The borehole camera was ineffective at the Oso plant because of a continuous layer of wall cake in the drill holes. Removal of the wall cake caused caving and prevented use of the borehole TV camera. Oriented core data at Pyramid Powerplant were spot checked with the TV camera. Visibility was poor and TV observation could be made only at interbeds with a very sharp contrast. Oriented core proved to be a reliable and economical method for determining geologic structure.

R202661 67A

Voloshin, V; Nixon, D; Timberlake, L
ORIENTED CORE--A NEW TECHNIQUE IN ENGINEERING GEOLOGY
Paper, 1967 Natl Mtg of Assn of Engg Geologists, Dallas, Tex. State of California Dept of Water Resrcs, Palmdale, 18 p, 14 fig
DESCRIPTORS-- borehole cameras/ boreholes/ *core drilling/ cores/ drill holes/ *drilling equipment/ *engineering geology/ geologic formations/ geologic investigations/ *foundation investigations/ faults (geology)/ subsurface investigations/ beds (geology)/ joints/ surveying instruments/ excavation/ drilling
IDENTIFIERS-- diamond drilling/ drill hole TV cameras/ structural geology/ Oso Pumping Plant, Calif/ Pyramid Powerplant, Calif/ *oriented cores

R202682X67A TERRESTRIAL PHOTOGRAMMETRY

Photogeology most commonly uses stereoscopic pairs of aerial photographs for collecting geologic data. During the last few years, some interest has been shown in the use of terrestrial photographs in photogeology. To make terrestrial photogrammetry an easily usable tool for engineering geologists and civil engineers, a standard setup has been developed which eliminates the need for complicated photogrammetric equipment or the assistance of photogrammetric engineers. An example showing the application of the method for plotting geologic features of a quarry rockwall and measuring dip and strike of joints and bedding planes is included. Photopairs were taken with a Wild C-12 stereocamera set, having a 120-cm base between the cameras; a Zeiss stereotope was used for the plotting. Dip and strike measurements can be made either with the stereotope or with a parallax bar. Advantages of this method are: (1) features can be recorded accurately on a photograph, (2) plotting and measuring can be delayed until a more convenient time, (3) readings can be spaced evenly over an entire plot, and (4) measurements can be made at inaccessible locations. The method can be applied to other problems such as measuring earth movements, landslides, and excavations.

R202682X67A

Rengers, N
TERRESTRIAL PHOTOGRAMMETRY: A VALUABLE TOOL FOR ENGINEERING GEOLOGICAL PURPOSES. Jour of Intl Soc of Rock Mech, Vol 5, No 2-3, pp 150-154, 1967. U of Karlsruhe, W Germany, 5 p, 3 fig, 1 tab, 3 ref
DESCRIPTORS-- *stereoscopic photography/ stereoscopes/ photography/ beds (geology)/ photographic equipment/ surveying/ surveying instruments/ field investigations/ optical instruments/ measuring instruments/ *engineering geology/ quarrying/ geologic investigations/ *photogrammetry
IDENTIFIERS-- parallax/ rock joints/ strikes (geology)/ plotters/ foreign products/ photointerpretation

R202696 67A BRANTLEY RESERVOIR SITE

The proposed Brantley Reservoir on the Pecos River in New Mexico would be located on mid-Permian evaporite, carbonate, and clastic sedimentary rock formations. The site was investigated by the Bureau of Reclamation from 1961 to 1964 to delimit the contact of evaporite and carbonate facies, establish that the carbonate rocks were a ground water barrier, and determine the site's acceptability as a suitable reservoir basin and damsite. Techniques included coring, percolation tests, water sampling, electric and gamma ray logging, and water table measurements. The rocks form a gently dipping homocline disrupted in places by hydration and solution of evaporites. Karstic terrain prevails in much of the area. The reservoir, on cavernous evaporite and pervious breccia, abuts tight carbonate rocks downdip. Ground water conditions are favorable, leakage will be small, no deep percolation is foreseen, and conservation storage is practical. Brantley damsite on carbonate rocks was determined to be sound. Has 15 references.

R202696 67A

Redfield, Robert C
BRANTLEY RESERVOIR SITE--AN INVESTIGATION OF EVAPORITE AND CARBONATE FACIES Engg Geol, Vol 4, No 2, pp 14-30, July 1967. Bureau of Reclamation, Amarillo, Tex, 17 p, 6 fig, 15 ref
DESCRIPTORS-- *engineering geology/ *geologic investigations/ dolomites/ geologic formations/ dam foundations/ *foundation investigations/ gypsums/ bibliographies/ groundwater geology/ water table/ percolation/ limestones/ reservoir surveys/ reservoirs/ rocks/ geology/ damsites/ *reservoir sites/ subsurface investigations/ wells/ core drilling/ water sampling
IDENTIFIERS-- evaporites/ Brantley Reservoir, N Mex/ reservoir storage/ Pecos River/ karst/ anhydrite/ Seven Rivers formation, N M/ McMillan Dam, N Mex/ cavernous rock/ reservoir leakage

GEOLOGY AND GEOPHYSICS

R202697 67A STRONG EARTHQUAKE GROUND MOTIONS

Strong-motion accelerographs have been developed for measuring ground shaking associated with destructive earthquakes. These instruments produ basic data for the design of earthquake-resistant structures. Earthquake ground motion, measurement of ground acceleration, earthquake response spectrum, accelerograph site conditions, and the current status of the strong-motion accelerograph network are discussed. Strong-motion acceler graph studies of strong earthquakes have shown that: maximum ground acceleration on firm alluvium in the epicentral region is about 0.5 g; maximum duration of heavy ground shaking on firm alluvium is about 45 sec earthquake energy must be assumed to be distributed uniformly over a wide frequency spectrum at a given typical site; and local geological conditio may significantly influence the ground motion frequency characteristics i special cases. The high cost and service requirements of strong-motion accelerographs have stimulated the development of the seismoscope, a simp device requiring no power, little attention, and costing approximately 1/ the price of a recording accelerograph. Has 16 references.

R202697

Hudson, Donald E
INSTRUMENTAL DATA ON STRONG EARTHQUAKE GROUND MOTIONS
Engg Geol, Vol 4, No 2, pp 31-41, July 1967. California Inst of Technol, Pasadena, 11 p, 3 fig, 16 ref
DESCRIPTORS-- *earthquakes/ seismology/ *seismic investigations/ seismic waves/ *accelerographs/ bibliographies/ accelerometers/ vibrations/ earth movements/ foundations/ engineering geology/ motion/ geophysics/ geology, seismographs/ instrumentation/ measuring instruments
IDENTIFIERS-- earthquake engineering/ earthquake loads/ seismoscopes

HYDRAULICS

R202664X67A COLUMN SEPARATION OF LIQUIDS IN PIPES

The primary objective of this study is to develop better insight into th mechanics and dynamics of column separation through application of a ra- tional technique for the theoretical analysis and engineering treatment this phenomenon. Particular attention is directed to the growth, form, collapse of the vapor cavity in a horizontal pipe of small diameter. Co umn separation is described and investigated in terms of governing fluid dynamics. Partial differential equations of continuity and momentum, in cluding nonlinear friction losses, are used to mathematically represent transient movement of liquids in full and partially full pipes. Systems equations are programmed for numerical simulation of the column-separati phenomenon, using a digital computer and the method of characteristics. Theoretical time-pressure information derived from mathematical simulati is compared with the corresponding experimental information obtained fro laboratory investigation. Despite higher-than-anticipated energy losses in the prototype flow, the general comparison of the 2 sets of informati is favorable. Has 26 references.

R202664X

Baltzer, R A
COLUMN SEPARATION ACCOMPANYING LIQUID TRANSIENTS IN PIPES
Paper 67-WA/FE-16, ASME Winter Ann Mtg & Energy Sys Expo, Pittsburgh, Pa Nov 1967. USGS, Washington, D C, 10 p, 9 fig, 26 ref
DESCRIPTORS-- *fluid flow/ *hydraulic transients/ vapor pressures/ pipes *closed conduits/ water hammer/ bibliographies/ digital computers/ *flui mechanics/ laboratory tests/ differential equations/ analysis/ simulatio mathematical analysis/ research and development/ cavitation/ *closed conduit flow
IDENTIFIERS-- *water column separation/ free surface

R202666X67A STABILITY OF A SIMPLE SURGE TANK

When a turbine is automatically governed, the surge tank is hydraulically stable only if the cross sectional area of the tank exceeds a certain minimum value. An equation is derived to describe small oscillations in a simple surge tank for a wider range of operating conditions. This equation is presented in a new nondimensional form which facilitates an immediate prediction of surge phenomena when small disturbances are imposed on any given set of steady-state conditions. A characteristic of general form is assumed for conduit friction, and the effect of deviation from the condition of constant hydraulic power delivered to the turbine is considered. Experiments were conducted with a laboratory model simulating a variety of steady-state operating conditions, and surge measurements are presented for comparison with the calculated behavior.

R202666X67A

Duggins, R K
THE STABILITY OF A SIMPLE SURGE TANK
Paper 67-WA/FE-18, ASME Winter Ann Mtg & Energy Sys Expo, Pittsburgh, Pa, Nov 1967. Nottingham U, G B, 6 p, 8 fig, 3 ref
DESCRIPTORS-- *surge tanks/ *hydraulic turbines/ velocity/ water/ friction/ oscillation/ head losses/ model tests/ curves/ surges/ *stability analysis/ differential equations/ damping/ investigations/ laboratory tests/ speed regulators/ analysis/ *penstocks/ hydraulic machinery/ fluid mechanics/ hydraulic conduits
IDENTIFIERS-- governors/ stability/ Great Britain/ foreign research

R202670X67A SURGE TANK LOCATION AND SPEED REGULATION

One of the main problems arising during studies made in connection with the general layout of a hydroelectric plant is the plant's ability to follow rapid load changes without serious disturbance to the system through hunting or excessive frequency and voltage changes. Influence of the surge tank location on the regulating ability of the plant, with all other characteristics of the units remaining the same, is studied; a comparison is made with results obtained from calculations for the same plant without a surge tank and with penstocks of varying diameters. Alternative solutions having equal regulating capacities can be considered as equivalent; the final choice then can be based on safety, construction facility, and costs. Equations and computer programs for stability analysis of hydroelectric plants with and without surge tanks are presented.

R202670X67A

Valvis, P G
LOCATION OF A SURGE TANK IN RELATION TO SPEED REGULATION
Water Pwr, Vol 19, No 11 & 12, pp 463-468 & 503-514, Nov & Dec 1967. Public Pwr Corp Greece, Athens, 11 p, 4 fig, 7 ref, append
DESCRIPTORS-- *surge tanks/ *stability analysis/ hydraulic turbines/ high pressures/ speed regulators/ computer programming/ hydraulic transients/ hydroelectric powerplants/ systems analysis/ disturbances/ investigations/ *penstocks/ hydraulic machinery/ hydraulic engineering/ economics/ safety/ costs/ locations/ pressure tunnels/ pipelines
IDENTIFIERS-- *hydraulic design/ hydraulic properties/ Greece/ foreign research

HYDRAULICS

R202694X67A WATER HAMMER IN SMALL DIAMETER PIPES

A simplified method of including fluid friction effect and other hydraulic losses in water hammer equations by direct superposition of the elastic effects on the pressure rise caused by very slow closure is presented. Experiments show this method gives accurate results. A valve designed to close under gravity will almost always close in a time that amounts to instantaneous closure. A profiled plug valve is of no value unless the rate of closure is controlled. Formulas for design of valve plug profiles are presented, but further investigation into hydraulic properties of small bore valves is necessary before these formulas can be applied successfully. Tests showed that use of a servocontrol in place of the usual fixed-area pilot orifice of a pilot-operated valve is the most effective way of reducing water hammer. Pressures close to the theoretical value for uniform retardation of water in a pipe (the maximum reduction possible) were observed. The servocontrol mechanism is simple, inexpensive, and commercially practicable.

R202694X67A

Pagdin, B C and Sarginson, E J
THE ANALYSIS AND ELIMINATION OF WATER HAMMER IN SMALL BORE MAINS
Civil Engg, Vol 62, No 727 & 728, pp 179-183 & 343-345, Feb & Mar 1967.
Laycock Engg Ltd, Sheffield, G B; U of Sheffield, G B, 7 p, 12 fig, 4 tab, 7 ref
DESCRIPTORS-- *water hammer/ hydraulics/ losses/ friction/ *plug valves/ analysis/ servomechanisms/ water pressures/ investigations/ flow control/ *pipelines/ fluid friction/ pressure pipes/ values/ experimental data/ closing/ *valves/ mechanical engineering/ hydraulic gates and valves/ water pipes/ head losses
IDENTIFIERS-- hydraulic design/ hydraulic pressure/ hydraulic properties/ Great Britain/ foreign research

HYDROLOGY

R202635 67A PROGRESS OF HYDROLOGY

The challenge of hydrology, recent activities, events, and major problems in hydrology and advances in hydrological techniques are discussed. New scientific knowledge and techniques developed in many modern scientific disciplines and recognition of the importance of hydrology in water resources development enable and encourage the hydrologist to advance scientific hydrology. Many programs to promote hydrology have been developed; e.g., the Universities Council on Water Resources and the President's Water for Peace Program in the U S and programs of the International Hydrological Decade. The most important advance in theoretical hydrology is the development of a new concept of dynamic sequential systems for the hydrological cycle, thereby creating new fields of systems, parametric, and stochastic hydrology. Modern scientific instrumentation provides the hydrologist with better tools for solving his problems. The most important of these, such as electronic computers, remote sensing, and nuclear techniques, are examined. Four central problematical subjects facing the hydrologist are reviewed: effects of man on his environment, dynamics of aqueous flow systems, hydrological transport mechanism, and ground water hydrology. Nuclear techniques used in solving various hydrological problems are discussed. Has 19 references.

R202635 67A

Chow, V T
THE PROGRESS OF HYDROLOGY
Proc, Intl Atomic Energy Agency Symp on Isotopes in Hydrol, Vienna, Austria, pp 3-20, 1967. U of Illinois, Urbana, 18 p, 19 ref
DESCRIPTORS-- *hydrology/ *hydrologic data/ project planning/ forecasting/ bibliographies/ *water balance/ water quality/ aerial photography/ reviews/ nuclear energy/ radioactive isotopes/ gamma rays/ research and development/ watersheds/ evapotranspiration/ computer programming/ simulation/ multiple purpose projects/ remote control systems/ water/ radar
IDENTIFIERS-- hydrologic cycle/ International Hydrolog Dec/ stochastic data simulation/ stochastic models/ tritium/ nuclear technology/ remote sensing/ nuclear engineering

R202638 67A RADIOISOTOPES MEASURE STREAMFLOW

An attempt is made to evaluate methods using radiotracers in streamflow measurements. Basic principles of the tracer method are explained and background information is given. Radiotracers used in stream discharge measurements are discussed and measurements made by different research workers are described. Problems such as adsorption of the tracer and mixing length are discussed, and potential use of the radioisotope as a tracer in routine stream-gaging work is evaluated. At the present stage of development, radiotracer methods do not seem to be ready for routine use in stream-gaging work and can be used only in special cases. Problems relating to safety, transport, and injection must be solved for gamma-emitting radioisotopes. Although tritium is a very useful tracer in some respects, it has the disadvantages of: (1) a relatively long half-life, and (2) disturbing natural tritium levels in the region. An attempt is made to define the objectives of research in the field of radioisotope application in hydrometry.

R202638 67A

Dincer, T
APPLICATION OF RADIOTRACER METHODS IN STREAMFLOW MEASUREMENTS
Proc, Intl Atomic Energy Agency Symp on Isotopes in Hydrol, Vienna, Austria, pp 93-113, 1967. IAEA, Vienna, Austria, 21 p, 2 fig, 12 ref, disc
DESCRIPTORS-- *radioactive isotopes/ *tracers/ *streamflow/ *water measurement/ *discharge measurement/ adsorption/ mixing/ stream gages/ gamma rays/ hydrology/ half life/ sodium/ chromium/ phosphorus/ injection/ water sampling
IDENTIFIERS-- tritium/ bromine/ iodine/ gold/ yttrium/ Austria/ foreign research/ bromine isotopes/ iodine isotopes/ gold isotopes

R202639 67A NUCLEAR-SEDIMENT CONCENTRATION GAGES

Laboratory tests compared 3 sediment concentration gages using attenuation of transmitted gamma rays as a measure of density; 2 gages used cadmium-109 as the radioactive source and 1 used americium-241. Effects of each probe on stream velocity and sediment concentration gradients within the sampling area were considered. Precision and accuracy of laboratory measurements were calculated and calibration curves plotted for static and dynamic conditions. A minimum detectable sediment concentration of less than 500 ppm was obtained with the americium-241 gage. The cadmium-109 gage, least sensitive to small changes in sediment concentration, was developed for remote, unattended, automatic operation and tested under field conditions. Performance of the automated cadmium-109 gage was evaluated in terms of conventional sediment sampling. Interpretation of a single-point concentration of sediment is different from that of an integrated sample. Each gage is designed for a particular application and performs best under certain conditions. In their present state of development, these nuclear-sediment concentration gages supplement rather than compete with each other; each provides the hydrologist with information not now obtainable by conventional means or will provide more information at a lower expenditure than is now possible.

R202639 67A

McHenry, J R; Coleman, N L; Willis, J C, et al
PERFORMANCE OF NUCLEAR-SEDIMENT CONCENTRATION GAGES
Proc, Intl Atomic Energy Agency Symp on Isotopes in Hydrol, Vienna, Austria, pp 207-225, 1967. USDA, Oxford, Miss, 19 p, 10 fig, 1 tab, 10 ref, disc
DESCRIPTORS-- *sediments/ sediment sampling/ nuclear energy/ *gages/ sedimentation/ suspended sediments/ performance tests/ laboratory tests/ density/ hydrology/ calibrations/ *radioactive isotopes/ x-ray/ *measuring instruments/ attenuation/ sediment transport/ sediment concentration/ volumes/ cadmium/ *gamma rays/ hydraulics/ montmorillonites
IDENTIFIERS-- *nuclear probes/ *sediment samplers/ sediment yield/ sediment load/ Parametrics sediment gage/ sediment distribution

HYDROLOGY

R202647X67A SEDIMENT TRANSPORT AND DIFFUSION

The lower Columbia Estuary of the Columbia River is filling with bottom river- and ocean-borne sediments, while immediately offshore, obstruction of the natural littoral regime has created vast areas of accretion and erosion. Past investigations, including measurements and hydraulic model tests, reveal a unique pattern of sediment transport and diffusion prevailing in this region. Studies indicate that from October 1962 to September 1963 the total sediment discharge of the Columbia River at Vancouver was 8,400,000 tons, consisting principally of clay and silt with the amount of coarse sediment being about 25% of the total sediment discharge. Annual dredging of part of this material is required to maintain a navigable channel, leading to the conclusion that the estuary is acting as a trap for the collection of bottom sediments.

R202647X67

Lockett, John B
SEDIMENT TRANSPORT AND DIFFUSION: COLUMBIA ESTUARY AND ENTRANCE
ASCE Proc, Jour Wtrwys & Hbrs, Vol 93, No WW4, Paper 5601, pp 167-175, Nov 1967. U S Army Engrs, Portland, Oreg, 9 p, 1 fig, 3 tab, 5 ref
DESCRIPTORS-- *sediment transport/ sediment sampling/ *diffusion/ dredging/ sediment control/ *estuaries/ tides/ salinity intrusion/ erosion/ jetties/ shoaling/ wave action/ hydraulic models/ channel improvements/ maintenance/ sediment production/ river currents/ hydraulics/ hydrology/ littoral drift/ sedimentation
IDENTIFIERS-- tidal hydraulics/ Columbia River

MATHEMATICS

R202643X67A SOLVING NONLINEAR DIFFERENTIAL EQUATIONS

One of the most difficult problems in applied mathematics concerns the solution of nonlinear differential equations. A technique for solving certain nonlinear ordinary differential equations is presented in a form suitable for use by nonmathematicians. A transformation of the dependent variable is used to associate the unsolvable nonlinear differential equation with a solvable differential equation called the base equation. Tests are given to determine whether the original equation is solvable by a variable transformation, since not all nonlinear equations have this property. For an association to exist between the original equation and the base equation, a set of auxiliary equations must be satisfied; these are the connective conditions relating the various functions appearing in the original equation. By satisfying the connective conditions, the solution to this original equation can be constructed by the use of a functional relationship. The functional relationship is determinable and in essence is the transformation expressing the solution of the original equation in terms of the solution of the base equation.

R202643X67

Lerman, Robert A and Despautz, Joseph F
ANALYTICAL SOLUTIONS OF NONLINEAR DIFFERENTIAL EQUATIONS
Instrum & Control Systems, Vol 40, No 11, pp 99-102, Nov 1967. Hamilton Standard, Windsor Locks, Conn, 4 p, 7 ref
DESCRIPTORS-- *differential equations/ *mathematics/ *mathematical analysis/ *transformations/ linear systems/ nonlinear systems/ integration/ calculus/ methodology/ instruction/ *systems analysis/ engineering/ analysis
IDENTIFIERS-- equations/ analytical method/ problem solving

R202655X67A OPTIMUM DESIGN

Engineering design is viewed as a 3-stage iterative process: (1) selecting a structure and identifying the design variables, (2) assigning numerical values to these design variables, and (3) evaluating the design and deciding whether any of the steps need repeating. Although computer-aided design has greatly reduced the time required to evaluate proposed designs, parameter value selection is an area in which computers have not found wide usage. This paper deals with the use of a computer to systematically modify parameters of a given design, thereby generating a sequence of improved new designs at each step. Many engineering design problems can be formulated as inequality constraints on the system response functions and design parameters. Any set of design variables satisfying these constraints is an acceptable design. The best or optimal design may be defined in a meaningful minmax sense and can be found by solving a related nonlinear programming problem involving the minimization of an easily determined objective function subject to inequality constraints. Minimization techniques are described briefly. Has 20 references.

R202655X67A

Waren, Allan D; Lasdon, Leon S; Suchman, Daniel F
OPTIMIZATION IN ENGINEERING DESIGN
Proc of IEEE, Vol 55, No 11, pp 1885-1897, Nov 1967. Bell Telephone Labs, Inc, Murray Hill, N J; Case-Western-Reserve U, Cleveland, Ohio; Clevite Corp, Cleveland, Ohio, 13 p, 15 fig, 1 tab, 20 ref
DESCRIPTORS-- *design/ design tools/ *optimum design/ computers/ digital computers/ *computation/ normalizing/ bibliographies/ numerical method/ *computer programming/ mathematics/ mathematical analysis/ *algorithm/ boundary values/ nonlinear systems
IDENTIFIERS-- iteration method/ optimization

R202684X67A DATA COMMUNICATION REQUIREMENTS

The area in which data communication and computer systems in combination furnish a useful service is growing rapidly, and there are indications of a much greater growth in the future. Communication requirements for the wide variety of different data processing systems fall into 2 basic types: (1) interaction with the machine at human speeds, and (2) information passed from machine to machine. When human interaction is involved, an input speed of 10 to 20 characters/sec is suitable; however, for machine-to-machine communication, channels are needed that can transfer data at 5000 characters/sec. In setting a criterion for transmission accuracy, error rates of the computers with which the circuits are coupled should be considered. Likewise, to facilitate expansion of remote data processing, uniformity of signaling rates and character codes is desirable. The widespread use of computers on a remote basis for inquiry-type operations can be expanded greatly if the low-speed data channel and the terminal represent a user cost similar to present telephone rates. Data processing, when supported by efficient and economical communications, appears to have potential uses far beyond any that have been indicated by current equipment using existing communications channels.

R202684X67A

McPherson, John C
DATA COMMUNICATION REQUIREMENTS OF COMPUTER SYSTEMS
IEEE Spectrum, Vol 4, No 12, pp 42-45, Dec 1967. IBM Corp, Armonk, N Y, 4 p, 7 ref
DESCRIPTORS-- *data transmission systems/ requirements/ *computers/ digital systems/ standards/ systems analysis/ operations research/ characteristics/ networks/ *communications/ technology/ data collection systems/ *data processing systems/ methodology
IDENTIFIERS-- remote data stations/ man-machine systems/ *communication systems/ data elements/ display systems/ information systems/ performance

R202689X67A ECONOMICS OF TIME-SHARED COMPUTER SYSTEMS

The economic impact of time-shared computer systems is yet to be felt, despite the considerable attention recently devoted to such systems. For this reason, perhaps, little has been written on the subject of system economics and cost-effectiveness of such systems. However, increasing interest in time-shared systems eventually will stimulate much greater attention toward large-scale centralized computer complexes. The authors discuss several subjects related to system economics and cost effectiveness, including conventional batch processing vs time-sharing, technical design considerations and operating experience factors, scheduling algorithms, computer configuration aspects, hardware and software cost considerations, accounting problems, and pricing techniques. Attention is focused on establishing criteria for system evaluations, primarily for the benefit of the manager who is faced with decisions involving the use of a time-sharing system.

R202689X67

Bauer, Walter F and Hill, Richard H
ECONOMICS OF TIME-SHARED COMPUTING SYSTEMS
Datamation, Vol 13, No 11 & 12, pp 48-53 & 41-49, Nov & Dec 1967.
Informatics Inc, Sherman Oaks, Calif, 12 p, 6 fig, 1 tab, 2 ref
DESCRIPTORS-- *computers/ economics/ *cost comparisons/ operations/ design criteria/ decision making/ configuration/ *computer systems components/ operations research/ systems analysis/ efficiencies/ requirements/ methodology/ flexibility/ scheduling/ management
IDENTIFIERS-- *time sharing/ *batch processing (data)/ software/ computer capability/ objectives/ on-line operation/ hardware (computer)

R202692X67A AUTOMATIC DRAFTING

Automatic drafting machines (ADM) are used primarily for 2 basic purposes-generating drawings (drafting) and converting existing drawings to digital representation (digitizing). Automating the drafting function is best accomplished by the use of digitally controlled drafting machines, analog drafting machines, and incremental plotters. The ADM has 4 advantages which conventional drafting techniques cannot duplicate: speed, accuracy, versatility, and economy. A typical automatic drafting system is composed of the control unit, a send-receive keyboard, an interface unit, a position buffer, and the drafting head. All drafting machines can generate automatically simple geometric shapes such as circles, ellipses, and other second-degree curves. Newer machines can generate many more complex shapes and functions and perform high-speed contouring and curve fitting, interpolation, and fairing. The more sophisticated systems can generate isometric and trimetric drawings, including vanishing-point perspectives. Three types of drafting especially suited to ADM are drawings of parts that can be manufactured or inspected by numerically controlled machinery, master dimension and full-scale loft drawings, and drawings to be reduced by photographic means.

R202692X67

Lavoie, Francis J
AUTOMATIC DRAFTING
Mach Design, Vol 39, No 30, pp 94-101, Dec 21, 1967. 7 p, 1 fig, 12 photos, 1 tab
DESCRIPTORS-- *drawing/ *design tools/ *computer systems components/ data processing systems/ computers/ automation/ *digital systems/ analogs/ two dimensional/ electronics/ computer programming/ transformations/ surfaces/ charts/ characteristics/ graphical analysis/ curve fitting/ geometric shapes/ volume/ design
IDENTIFIERS-- *automatic plotters/ *display systems/ *digitizers/ man-machine systems/ computer-aided design/ accuracy/ layout/ schematic diagrams/ electrical design

R202691X67A HONEYCOMB MATERIALS

MATERIALS ENGINEERING

The use of lightweight, rigid honeycomb materials is well established in construction of aircraft and space vehicle structures and is increasing in industrial applications. Properties and applications of various honeycomb core materials are described. Kraft paper cores are the least expensive. Aluminum generally is used for loads and temperatures too high for paper. Plastic cores are useful at elevated temperatures and for thermal or electrical insulation. Superalloy or refractory metal honeycomb cores are used in high-temperature applications. Strength and stiffness of honeycomb panels are determined by cell size and shape as well as by the thickness and properties of core and face sheet materials. Bending loads are absorbed by face sheets, and the core material absorbs shear loads; the cores also support compressive loads normal to the panel surface. Mechanical properties are listed for typical sandwich facing materials and plastic, stainless steel, nickel alloy, and aluminum alloy cores. A graph showing comparative costs of honeycomb core materials is given.

R202691X67A

Busche, Michael G
TODAY'S HONEYCOMB: LIGHT, RIGID--MORE USES
Matls Engg, Vol 66, No 7, pp 62-66, Dec 1967. 5 p, 6 fig, 4 tab
DESCRIPTORS-- materials/ *composite materials/ sandwiching/ nickel alloys/ mechanical properties/ paper/ aluminum/ aluminum alloys/ plastics/ electric insulation/ *building materials/ panels/ cores/ rigidity/ stainless steel/ costs/ stiffness/ thermal insulation/ mechanical insulation/ construction/ design/ geometric shapes/ *cellular structures
IDENTIFIERS-- materials engineering/ *honeycomb construction/ *sandwich construction

R202662X67A STAY VANE CRACKING ON PROPELLER TURBINES

MECHANICAL ENGINEERING

Water flowing around an obstacle can cause a stable pattern of eddies in the wake of the obstacle, a phenomenon which is self-exciting and generally of no more consequence than that of the wake. Occasionally the frequency of these von Karman vortexes may coincide with the natural frequencies of the structure, resulting in hydroelastic resonance and fatigue failure in the structure. A distinguishing feature of these vortex-induced vibrations is the persistence of a single frequency of vibration, coinciding with one of the resonant frequencies of the structure over a wide range of turbine flows. Damage caused by von Karman hydraulic vortexes to the stay vane structures of the 2 turbines at Ontario Hydro's Little Long Powerplant is reported. Extent of damage is assessed, and the nature of repairs and modifications are discussed. Has 16 references.

R202662X67A

Goldwag, E and Berry, D G
VON KARMAN HYDRAULIC VORTEXES CAUSES STAY VANE CRACKING ON PROPELLER TURBINES AT THE LITTLE LONG GENERATING STATION OF ONTARIO HYDRO. Paper 67-WA/FE-40, ASME Winter Ann Mtg & Energy Sys Expo, Pittsburgh, Pa, Nov 1967. English Elec Co, Ltd, Netherton, G B; Ontario Hydro, Toronto, Canada, 5 p, 6 fig, 2 tab, 16 ref
DESCRIPTORS-- *hydraulic turbines/ turbine parts/ flow/ *vortices/ stress/ *vibrations/ *stay vanes/ bibliographies/ *fatigue (mechanics)/ repairing/ natural frequency/ fluid mechanics/ wickets/ inspection/ eddies/ strain measurement/ foreign projects/ resonance
IDENTIFIERS-- Canada/ vibration control/ wicket gates/ Little Long Gen Sta, Canada

MECHANICAL ENGINEERING

R202665X67A ESTIMATING PUMP EFFICIENCY FROM MODELS

The increasing use of large pumps has focused attention on methods of predicting the efficiencies of prototype machines from results of model tests. Interest in the scale effect between model and prototype machines began as early as 1880, and the first formula for conversion of turbine data was published by Cramerer in 1909. This formula included allowances for differences in size and surface roughness of the machines and mean velocity and kinematic viscosity of the fluid. Surface friction was estimated by a formula requiring evaluation of a hydraulic radius representative of the flow passages in the machine. Recent studies on estimating the efficiencies of large pumps are reviewed and summarized. The general formula for estimating efficiency of a prototype pump from tests of a geometrically similar model is derived, and a selection of formulas for pumps is presented. Has 40 references.

R202665X67A

Kittredge, C P
ESTIMATING THE EFFICIENCY OF PROTOTYPE PUMPS FROM MODEL TESTS
Paper 67-WA/FE-6, ASME Winter Ann Mtg & Energy Sys Expo, Pittsburgh, Pa, Nov 1967. Princeton U, N J, 9 p, 13 fig, 4 tab, 40 ref, 2 append
DESCRIPTORS-- *pump tests/ *pumps/ *efficiencies/ *model tests/ models/ losses/ bibliographies/ kinetics/ hydraulic machinery/ mixed flow pumps/ propeller pumps/ specific speed/ centrifugal pumps/ impellers/ turbines/ performance tests/ boundary layer/ curves/ energy losses
IDENTIFIERS-- friction coefficient (hyd)/ hydraulic design

METEOROLOGY AND ATMOSPHERIC WATER RESOURCES

R202708X67A COMPUTER ASPECTS OF METEOROLOGY

A long history of large-scale scientific computing is associated with numerical weather prediction. Recently, interest in this field has been renewed as a result of international studies concerning the feasibility of a global observation and analysis experiment preliminary to the World Weather Watch. Physical phenomena occurring in the atmosphere and problems of modeling them for computer analysis are described. The numerical methods commonly used in general circulation models are examined and the relative advantages discussed. An analysis of computer requirements for global weather calculations is developed, emphasizing the need for very fast computers capable of executing the equivalent of hundreds of millions of instructions per second. Gives 30 references.

R202708X67A

Kolsky, H G
SOME COMPUTER ASPECTS OF METEOROLOGY
IBM Jour of R&D, Vol 11, No 6, pp 584-600, Nov 1967. Scientific Center, Palo Alto, Calif, 17 p, 9 fig, 3 tab, 30 ref
DESCRIPTORS-- *meteorology/ *weather forecasting/ models/ *computer programming/ weather/ computers/ time/ mountains/ bibliographies/ spheres/ numerical method/ wind (meteorology)
IDENTIFIERS-- *computer capability/ worldwide

R202648X67A RIVER BASIN PLANNING & URBAN DEVELOPMENT

In a metropolitan nation, coordination of river basin planning and metropolitan planning becomes important. To achieve this coordination, planning for river basin development must be brought under a unified command, and communities in metropolitan areas must find ways to reach consensus on their common objectives and on plans to achieve them. Changing social and economic circumstances are making urban areas more aware of their river resources. As political power shifts to the urban areas, a larger voice in planning the development of river basins will be gained. Increasing Federal emphasis on metropolitan planning and creation of river basin planning agencies are 2 promising trends in the development of closer coordination in the planning of river basins and metropolitan areas. A general description is given of the Atlanta-Chattahoochee Study undertaken by the Georgia Institute of Technology to learn how development of river basins and metropolitan areas relate to each other.

R202648X67A

Kelnhofer, Guy J, Jr
RIVER BASIN PLANNING AND URBAN DEVELOPMENT
ASCE Proc, Jour Urban Plan & Dvlpmt, Vol 93, No UP4, Paper 5619, pp 151-161, Dec 1967. Georgia Inst of Tech, Atlanta, 11 p
DESCRIPTORS-- *river basin development/ *urban areas/ planning/ projects/ project planning/ *cities/ coordination/ agreements/ river basins/ water supplies/ municipal water/ resource development/ *water development/ social values/ water resources/ economics
IDENTIFIERS-- *regional authorities/ eutrophication/ Chattahoochee River, Ga/ Atlanta, Ga

R202649X67A WATER RESOURCE PLANS--OUTDOOR RECREATION

The magnitude of the contributions of major water resource projects to recreation environment is assessed, and contributions needed for the future and means of achieving them are discussed. Estimates indicate that major water resource projects provide approximately 10,000,000 acres of water surface and that these projects, together with related lands, furnished over 500,000,000 days of recreation to visitors in 1965. Current projections indicate a need by 1980 of double the reservoir storage capacity in existence 20 yr earlier and triple the 1960 capacity by 2000. Projections for outdoor recreation demand are of similar magnitude. The growing uses of recreation resources associated with water resource projects reflect their great contribution to outdoor recreation, and future needs must be considered fully in planning, developing, and administering water resource projects. Problems and objectives of providing and maintaining a high-quality recreation environment at these projects should be understood clearly by all personnel having water resource interests and responsibilities. Through mutual understanding, much can be done to shape and assure the future of water-based outdoor recreation in this nation.

R202649X67A

Jones, Gordon H
WATER RESOURCE PROJECTS AND OUTDOOR RECREATION
ASCE Proc, Jour Urban Plan & Dvlpmt, Vol 93, No UP4, Paper 5652, pp 141-150, Dec 1967. U S Army Corps of Engrs, Dallas, Tex, 10 p, 3 fig, 1 tab, 3 ref, append
DESCRIPTORS-- water resources/ project planning/ *outdoors/ *recreation/ reservoirs/ environment/ natural resources/ *resource development/ fish and wildlife/ population growth/ municipal water/ industrial water/ pollution abatement/ water storage/ water quality/ projects/ management/ flood control/ water management/ *recreational facilities
IDENTIFIERS-- Bureau of Reclamation/ Corps of Engineers/ Tennessee Valley Authority

ROCK MECHANICS

R202676X67A ROCK FRACTURE PATTERNS

Procedures for predicting distribution of stresses in rock structures and around excavations commonly are developed from the theory of elasticity approach, assuming continuous and homogeneous rock or from the soil mechanics approach, assuming highly fractured rock with an irregular crack system. In nature, rock is normally traversed with joints, cracks, or planes of weakness arranged in well-defined patterns extending over large areas. These regular systems of joints and cracks, with particular emphasis placed on the states of limiting equilibrium, are analyzed. Attention is devoted to shear failure. An idealized joint with a saw-tooth profile is examined to determine the influence of joint irregularities on shear resistance. Failure characteristics of a rock mass traversed by a set of parallel plane joints are displayed by a polar diagram; the diagram is used then to derive failure characteristics of materials having various composite crack systems. Anisotropic behavior of these materials is related to the number of differently oriented planes and the coefficient of friction. A system of discontinuous joints is analyzed by a modified Griffith theory.

R202676X67

Bray, J W
A STUDY OF JOINTED AND FRACTURED ROCK
Jour of Intl Soc of Rock Mech, Vol 5, No 2-3, pp 117-136, 1967. U of London, G B, 20 p, 15 fig, 10 ref
DESCRIPTORS-- *rock mechanics/ strength of materials/ *stress analysis/ stress distribution/ rocks/ cracks/ *fractures/ faults (geology)/ elastic theory/ *shear strength/ shear stress/ shear failures/ friction/ shear planes/ failure (mechanics)/ engineering geology/ anisotropy
IDENTIFIERS-- Griffith theory/ rock joints/ rock dilation/ *joint systems/ Coulomb-Navier model

SOILS ENGINEERING

R202642 67A EFFECT OF WATER CONTENT ON STRAIN IN LOAM

A study was made to better understand the action required of tillage implements to break up a soil mass. Failure within a soil mass can be produced by a wide range of applied stresses. A method is described for measuring axial strain in a remolded loam soil under unconfined axial loading in compression and tension. Using this method, stress-strain relationships for the loam soil were determined for soil-water contents ranging from 2 to 12% by weight. Maximum tensile stress in a soil beam stressed to failure in a modulus of rupture test was computed from the measured stress-strain relationships; this computed fiber stress was approximately 10% greater than the measured tensile strength. Strain energy required to rupture the soil in axial tension, taken as the area under the stress-strain curve, was shown to increase by only 20% for a sixfold increase in tensile strength and to be related almost proportionately to the energy required to produce a fixed degree of soil breakup in a drop-shatter test. Has 19 reference

R202642

Farrell, D A; Greacen, E L; Larson, W E
THE EFFECT OF WATER CONTENT ON AXIAL STRAIN IN A LOAM SOIL UNDER TENSION AND COMPRESSION. Soil Sci Soc of Amer Proc, Vol 31, No 4, pp 445-450, July-Aug 1967. CSIRO, Adelaide, Australia; ARS, USDA, Ames, Iowa, 6 p, fig, 1 tab, 19 ref
DESCRIPTORS-- *moisture content/ *axial strain/ *loams/ tensile strength/ tensile stress/ unconfined compression/ remolded soil samples/ soil tests/ bibliographies/ stress-strain curves/ stress/ strain/ failure (mechanics)/ *soil mechanics/ test procedures/ apparatus/ flexural strength/ laboratory tests/ research and development
IDENTIFIERS-- strain energy/ strain rate

R202675 67A RAPID METHOD FOR SOIL-CEMENT DESIGN

The Louisiana Slope Value Method is a laboratory design method developed to reduce the testing time in determining minimum cement content for use in soil-cement pavement construction. Use of the slope value method results in a decrease in testing time from 32 to 8 days. Testing is easy to perform, and use of the developed correlation curves and tables is simple and rapid. This method makes maximum use of AASHO procedures for wet-dry testing and PCA weight loss criteria and is simply a formalized expression of available statistical data. It is based on a tangible relationship between the susceptibility of different types of soil-cement mixtures to additional cement, as expressed by the slope of the 7-day unconfined compressive strengths developed at respective cement contents, and the wet-dry test losses realized at identical cement contents. This method was compared with the wet-dry test method; 92% of all cement contents recommended were within 2% of those contents called for by the latter method. A detailed procedure for using the slope value method is given in an appendix.

R202675 67A

Kemahlioglu, Ali; Higgins, C M; Adam, Verdi
A RAPID METHOD FOR SOIL-CEMENT DESIGN: LOUISIANA SLOPE VALUE METHOD
Hwy Res Record, No 198, pp 19-29, 1967. Louisiana Dept of Hwys, Baton Rouge, 11 p, 6 fig, 2 tab, 2 ref, append
DESCRIPTORS-- *soil cement/ soil classifications/ design tools/ laboratory tests/ compressive strength/ wetting and drying tests/ soil stabilization/ *durability/ portland cement/ test procedures/ unconfined compression/ soil tests/ design criteria/ *soil mechanics/ base courses/ remolded soil samples/ research and development
IDENTIFIERS-- *Louisiana Slope Value Meth/ cement content/ weight loss/ test results

R202701 67A SEEPAGE RINGS DETERMINE SOIL PERMEABILITY

USSR hydraulic engineers have examined an American method for determining soil permeability and seepage rates by large concentric rings and recommend its use because of its reliability, especially in layered soils. Other advantages of this method are use of Nesterov's principles for large wetted surfaces, familiar to Soviet soil specialists; simplicity of the test setup and ease of making measurements; and automation capability. Disadvantages are the longer time required for observations and the large quantity of water used. Seepage measurements were conducted on several test plots in the Golodnaia Steppe of Central Asia over a 3-yr period. The 2.6-m-dia metal inner ring set in a 10-cm furrow and the 7.8-m-dia earth outer ring faced with polyethylene film automatically were kept filled with water to a constant depth of 30 cm. Soil moisture was measured by neutron meters inserted into observation drill holes. Before-and-after measurements permitted fixing changes in the position of the wetting front, and with time, computing the wetting and seepage rates horizontally and vertically. Tests showed that wetting rate was at first greater than seepage; but later the rates became approximately equal and the slopes of representative curves became constant, indicating a stable seepage rate.

R202701 67A

Rainin, V E and Makarycheva, E A
DETERMINATION OF SOIL PERMEABILITY BY THE METHOD OF LARGE RINGS
Gidrotekhnika i Melioratsiia, No 1, pp 34-38, 1965. Transl from Russ, USBR Transl 686, Apr 1967, 13 p, 3 fig, 1 photo, 1 tab, 2 ref, append
DESCRIPTORS-- *permeability/ soils/ soil mechanics/ soil moisture/ ground water/ soil physical properties/ field tests/ *seepage/ test procedures/ velocity/ measurement/ neutron counters/ meters/ observation wells/ drill holes/ wet condition
IDENTIFIERS-- seepage rings method/ foreign research/ USSR/ soil moisture movement/ Golodnaia Steppe, USSR/ *wetting front

R202645X67A BEHAVIOR OF PRESTRESSED CONCRETE MEMBERS

Experimental test results are presented for 15 prestressed concrete members with unbonded tendons and using 2 cross-sectional shapes. A ribbed cross-sectional shape was used for beams tested as indeterminate 2-span continuous members and as determinate double-cantilever members simulating the negative moment region of multiple-span members. An I-shaped section was used for 8 simply supported beams, 4 of which were simple beams with an overhang on 1 end. Web reinforcement was used for only 4 of the 15 beams tested. Bonded reinforcement was included in all cases to distribute cracking in the concrete and contribute to the ultimate moment capacity at critical sections. Development of cracking, ultimate load capacity, and load-deflection response were of interest; some members failed in flexure, while others failed in shear. Test results are compared with values computed following the 1963 ACI Building Code requirements. Both flexural and shear strengths at ultimate are underestimated by the ACI Code. Trends from comparisons of measured to predicted values are discussed for beams having the 2 types of cross sections, and overall trends are presented. Contribution of the bonded deformed bars to strength and behavior of members with unbonded tendons is discussed.

R202645X67A

Burns, Ned H and Pierce, David M
STRENGTH AND BEHAVIOR OF PRESTRESSED CONCRETE MEMBERS WITH UNBONDED TENDONS
Jour of PCI, Vol 12, No 5, pp 15-29, Oct 1967. U of Texas, Austin, 15 p, 11 fig, 6 tab, 4 ref
DESCRIPTORS-- *prestressed concrete/ concrete testing/ *reinforced concrete/ flexural strength/ reinforcing steel/ test procedures/ codes/ continuous beams/ cross sections/ cracking/ bondings/ deflection/ beams/ failure (mechanics)/ shear strength/ cantilevers/ research and development/ concrete/ ribs/ stress-strain curves
IDENTIFIERS-- I-beams/ beams (structural)

R202650X67A SEISMIC LOAD ANALYSIS OF STEEL STRUCTURES

Seismic lateral design loads and subsequent load distribution to individual members of a multistory, multibay steel-framed structure were calculated as part of preliminary design procedure. Use was made of the general dynamic analysis method of setting up a frame stiffness matrix in terms of joint distortions and then inverting it to obtain the flexibility matrix from which the lateral flexibility matrix is extracted. Dynamic characteristics of the structure are first computed and used to predict the equivalent static seismic loading; then this loading is applied to the framework and the resulting member actions are determined. Consideration is limited to response within the elastic range. Methods used and results obtained from the analysis of a 14-story steel-framed building are given.

R202650X67A

Shepherd, R
SEISMIC LATERAL LOAD ANALYSIS OF A STEEL-FRAMED STRUCTURE
N Z Engg, Vol 22, No 10, pp 407-413, Oct 15, 1967. U of Canterbury, Christchurch, N Z, 7 p, 4 fig, 7 tab, 8 ref
DESCRIPTORS-- *seismic design/ *steel structures/ *lateral forces/ loads/ *structural design/ structural stability/ analysis/ building codes/ live loads/ dynamics/ computer programming/ dead loads/ structural analysis/ moments/ *buildings/ foreign design practices
IDENTIFIERS-- New Zealand/ earthquake engineering/ earthquake loads/ *earthquake-resistant struct

R202657X67A TRANSMISSION TOWER DESIGN BY COMPUTER

Three reasons for designing self-supporting transmission towers with the digital computer are: (1) to obtain a more rapid design, (2) to obtain greater accuracy for reasons of economy and structural integrity, and (3) the desirability of analyzing towers as indeterminate rather than determinate structures. Self-supporting towers are highly indeterminate structures. Until recently, analysis of such structures was done by determinate methods because of the number of calculations required in indeterminate methods. Results from determinate methods were often questionable because elastic properties of members were not considered. Today, complex numerical problems are solved routinely with high-speed digital computers. The author presents a technique for efficiently solving large systems of symmetrical linear equations obtained from an indeterminate method of analysis, without resort to matrix inversion. A procedure is given for incorporating the analysis into a tower design program.

R202657X67A

Jensen, H Gordon
EFFICIENT MATRIX TECHNIQUES APPLIED TO TRANSMISSION TOWER DESIGN
Proc of IEEE, Vol 55, No 11, pp 1997-2000, Nov 1967. Bonneville Pwr Admn, Portland, Oreg, 4 p, 2 fig, 4 ref
DESCRIPTORS-- *transmission towers/ design/ computers/ elastic theory/ load distribution/ computer programming/ pin connected joints/ analysis/ matrix algebra/ *structural design/ structural analysis/ *digital computers/ stiffness/ electrical networks/ flow diagrams/ transmission lines
IDENTIFIERS-- *self-supporting towers/ application techniques

R202677X67A LIMIT ANALYSIS OF A FIXED-ENDED T-BEAM

Limit analysis of a reinforced concrete fixed-ended T-beam is developed and compared with experimental test results. Limit design is one of the important steps toward optimum design of structural systems. The first step in limit analysis is to predict an accurate moment-curvature curve for each critical section in the structural system under study; then moment and curvature diagrams are drawn. Using these diagrams, equations for equilibrium and compatibility can be written; using the equations with a trial-and-error procedure, critical moment values can be found, leading to the determination of ultimate load. Experiments were performed on 3 reinforced concrete T-beams, each with the same dimensions but with varying amounts of reinforcement. Experimental results are compared with the theoretical data. An example illustrating the theoretical determination of the collapse load for a fixed-ended T-beam is presented in an appendix.

R202677X67A

Barker, Richard M and Murray, Kenneth H
TEST RESULTS ON THE LIMIT ANALYSIS OF A FIXED ENDED T-BEAM
Jour of ACI, Proc Vol 64, No 12, pp 820-826, Dec 1967. Virginia Polytechnic Inst, Blacksburg, 7 p, 7 fig, 3 tab, 4 ref, append
DESCRIPTORS-- *structural analysis/ structural engineering/ laboratory tests/ *beams/ test procedures/ *reinforced concrete/ *limit design/ fixed structures/ optimum design/ ultimate loads/ moments/ strain/ moment distribution/ apparatus/ codes/ compressive strength
IDENTIFIERS-- strain hardening/ curvature/ T-beams

R202678X67A POST-TENSIONED CONCRETE MASONRY WALL

Tests were performed on a full-sized post-tensioned concrete masonry wall to examine engineering problems of foundation structure interaction. The study was directed toward problems of building on heaving soils. The practical solution in masonry construction encountering this soil condition appears to be the development of a completely rigid structure capable of carrying its own weight under any support conditions, without serious deformation. Results of the test are compared with a design based on a truss analogy and an analysis as a 2-dimensional stress problem using McHenry's lattice analogy. With the exception of sections around the doorway in the wall, agreement between experimental results and the truss and lattice analogy solutions was very good. The wall was shown to be capable of withstanding (without serious distortion or cracking) loads of a magnitude which could be considered equal to those imposed on the wall of a house subjected to the most extreme foundation movements. A load greater than twice this was required to cause structural failure. The test indicates that the problems associated with masonry houses built on moving soils could be overcome by using post-tensioning methods similar to those used in this wall.

R202678X67A

Rosenhaupt, S; Beresford, F D; Blakey, F A
TEST OF A POST-TENSIONED CONCRETE MASONRY WALL
Jour of ACI, Proc Vol 64, No 12, pp 829-837, Dec 1967. CSIRO, Melbourne, Australia, 9 p, 9 fig, 5 ref
DESCRIPTORS-- *post tensioning/ *prestressed concrete/ *masonry/ *walls/ heaving/ foundations/ rigid frames/ deformation/ structural analysis/ shear failures/ structural design/ cracking/ reinforcing/ laboratory tests/ test procedures/ loads/ concrete
IDENTIFIERS-- foreign research/ Australia/ *concrete blocks

R202679 67A REINFORCED BRICKWORK USED IN BOX BEAMS

A series of full-scale tests was performed on composite cantilever box beams having reinforced concrete slabs as flanges and reinforced brick walls as webs. A savings can be realized by combining the cost advantage of brickwork with the strength and stiffness of box beam construction. Research was conducted to determine: (1) shear force-deflection relationship of the web of the composite box beam and (2) ultimate strength and load factor. Because the cantilever is the simplest structural unit in which these factors may be considered, it was chosen as the specimen to be examined. Special bricks with cutouts to accommodate vertical reinforcing bars were used for the first 2 tests. The walls for these tests were 9 in thick and contained horizontal reinforcement. Conventional bricks were used in the third test to allow a choice from the complete range of strengths and colors. This wall was 11 in. thick with diagonal reinforcing bars in a grouted cavity. The tests showed both wall types had large load-bearing capacity; the wall with diagonal bars performed particularly well. Some comparisons are made of the cost of these composite beams and similar ones constructed wholly in reinforced concrete.

R202679 67

Plowman, J M; Sutherland, R J M; Couzens, M L
THE TESTING OF REINFORCED BRICKWORK AND CONCRETE SLABS FORMING BOX BEAMS
Struc Engr, Vol 45, No 11, pp 379-394, Nov 1967. Messrs Harris & Sutherland, London, G B, 16 p, 25 fig, 5 tab, 2 ref, 3 append
DESCRIPTORS-- *bricks/ *masonry/ concrete/ *box beams/ *slabs/ reinforcing/ laboratory tests/ test procedures/ ultimate loads/ structural behavior/ deflection/ bondings/ cracks/ strain/ stress-strain curves/ cantilevers/ cost comparisons/ *structural engineering/ *walls/ building materials/ beams/ composite structures
IDENTIFIERS-- ultimate strength/ diagonal tension/ bond

R202680X67A - SOME THOUGHTS ON THE SOUTHWELL PLOT

The Southwell plot is examined in relation to the initial postbuckling behavior of a structure. Since its inception for column-buckling problems, the Southwell method has been used to determine critical load in frame- and plate-buckling experiments. Although use in these cases has been justified in the context of small deflection theory, little is known about the effect that nonlinearities in such structures have on the Southwell line. Depending on the nature of the postbuckling behavior, the Southwell method may underestimate or overestimate critical load; consequently, knowledge of postbuckling behavior is essential in the correct interpretation of a Southwell plot. Tests were performed on experimental structures consisting of triangulated frames made of high-tensile steel strip. Results of the study indicate that the Southwell procedure can be applied to structures other than columns, but great care must be taken in the interpretation of results.

R202680X67A

Roorda, John
SOME THOUGHTS ON THE SOUTHWELL PLOT
ASCE Proc, Jour Engg Mech, Vol 93, No EM6, Paper 5634, pp 37-48, Dec 1967.
U of Waterloo, Canada, 12 p, 7 fig, 9 ref, append
DESCRIPTORS-- *structural analysis/ *buckling/ structural models/ rigidity/ model tests/ *structural behavior/ deflection/ laboratory tests/ structural stability/ trusses/ joints/ rotation/ frames/ stress-strain curves/ loads/ elastic theory/ engineering mechanics/ *columns/ struts/ steel structures
IDENTIFIERS-- foreign research/ Canada/ Southwell method

R202681X67A SPACE-FRAMEWORK METHOD

A space-framework model is derived to represent a rectangular, prismatic, solid element assumed to be in a state of uniform stress and having any value of Poisson's ratio. The model consists of edge beams having axial and flexural rigidity and diagonal members in each external face having axial rigidity only; therefore, an equivalent space-framework can be established to simulate the behavior of an elastic, 3-dimensional continuum under applied load, deformation, or both. Two examples are analyzed to illustrate the applicability of the space-framework method and examine the relationship between accuracy of solution and mesh size. The examples also are analyzed by the finite-element method of Melosh, using his trilinear displacement element. Results from these numerical engineering methods are compared with the appropriate elasticity solutions given by Timoshenko and Goodier. In both cases the pinned model idealization was used and only cubic elements were employed to facilitate programming. The equivalent space-framework method provides a useful engineering approach to the stress and strain analysis of solid bodies, particularly in view of its ability to utilize computer programs readily available to practicing engineers.

R202681X67A

Yettram, Alan L and Robbins, Kenneth
SPACE-FRAMEWORK METHOD FOR THREE-DIMENSIONAL SOLIDS
ASCE Proc, Jour Engg Mech, Vol 93, No EM6, Paper 5633, pp 21-36, Dec 1967.
U of Leeds, G B, 16 p, 8 fig, 2 tab, 11 ref, 2 append
DESCRIPTORS-- three-dimensional/ *structural analysis/ matrix algebra/ *mathematical analysis/ stress/ *stress analysis/ stress-strain curves/ programs/ models/ numerical method/ elastic theory/ solids/ shear stress/ triaxial stress/ Poisson ratio/ joints/ torsion/ stiffness/ computers/ *engineering mechanics
IDENTIFIERS-- *mathematical models/ finite element method/ Great Britain/ foreign research

R202641 67A RADIOACTIVE TRACERS IN DIFFUSION TESTS

Use of radioisotopes for viscous or molecular flow experiments is useful mostly because of the complete analogy between the flow of the tagged and untagged species. The analogy requires that the equation of flow and initial and boundary conditions would lead to similar solutions for the 2 isotopes. In many cases a correction for the decay in radioactivity leads to such an analogy; however, in the presence of adsorptive processes or flow with sinks, the mathematical analogy may fail. This limitation occurs with time-dependent sinks, but it sometimes can be alleviated; e.g., if the radioactive tracer is of long half-life compared with the length of the experiment.

R202641 67

Mokady, R S and Zaslavsky, D
ON THE USE OF RADIOACTIVE TRACERS IN DIFFUSION EXPERIMENTS
Soil Sci Soc of Amer Proc, Vol 31, No 5, pp 604-608, Sept-Oct 1967. Israe Inst of Tech, Haifa, 5 p, 2 fig, 5 ref
DESCRIPTORS-- *radioactive isotopes/ *tracers/ *diffusion/ *dispersion/ experimental data/ flow/ groundwater flow/ sinkholes/ soils/ viscous flow/ phosphorus/ *isotopes/ half life/ radioactive decay/ adsorption/ porous materials/ *soil science/ phosphates
IDENTIFIERS-- porous media/ foreign research/ Israel

R202667X67A CLIMATE AND EVAPORATION FROM CROPS

Loss by evaporation (E) from well-watered crops can be estimated from measurements of the temperature (T) and the global-radiation intensity (Q sub s), using some empirical relationship between T and the ratio LE/Q sub s, in which L = the latent heat of evaporation of water. Relationships that have been proposed are corroborated roughly by data from outside the U S, but considerable scatter exists. This is partly caused by the effects of humidity and cloudiness variations, allowed for in the new equation for the ratio. The theory shows that the ratio LE/Q sub s depends not only on temperature, but on crop characteristics, climatic relative humidity, and the daily duration of bright sunshine. Thus, derivation of the ratio from temperature alone is unlikely to lead to reliable estimates of the evaporation rate. Gives 64 references.

R202667X6

Linacre, Edward T
CLIMATE AND THE EVAPORATION FROM CROPS
ASCE Proc, Jour Irrig & Drng, Vol 93, No IR4, Paper 5651, pp 61-79, Dec 1967. Commonwealth Sci & Ind Res Orgn, Griffith, Australia, 19 p, 10 fig 2 tab, 64 ref, 3 append
DESCRIPTORS-- *crops/ *evaporation/ *climatology/ irrigation/ humidity/ temperature/ bibliographies/ evapotranspiration/ *plant (botany)/ agronom clouds/ radiation effects/ forecasting/ *grasses/ estimating/ *consumptiv use (water)
IDENTIFIERS-- worldwide/ foreign research/ Australia/ correlation

R202634 67A RADIOISOTOPES IN WATER-POLLUTION STUDIES

Instrumentation for tracing dispersal of sewage in the sea is discussed. The tracer bromide-82 is added continuously to the flow of sewage entering the sea through a submerged outfall or alternatively as a single dose to the sea at the site of a hypothetical outfall. The dispersal is mapped by scanning the area with gamma-scintillation counters towed by a boat to sites of predetermined depths; the depths are monitored continuously by simple echo sounders. Counting rates, after scaling by a factor of 10, are recorded as pulses on individual tracks of a multichannel tape recorder; other tracks are used for timing pulses. The tapes are replayed on shore and the recorded information is transferred to conventional chart recorders or scalers. Results of typical surveys are given. Double-labeling techniques are described. By use of a nonadsorbable tracer to label the liquid phase and a highly adsorbed tracer to label the solid phase, segregation effects can be studied. The technique was used to demonstrate the short circuiting of solids in a sludge-digestion system and compare relative retention periods of dissolved and suspended matter in a percolating filter. By simultaneous addition of a nonadsorbed tracer and the radioisotope under investigation, reversible adsorption on the bed of a stream or on walls of a sewer can be detected.

R202634 67A

Eden, G E and Briggs, R
RADIOISOTOPE TECHNIQUES DEVELOPED IN WATER-POLLUTION STUDIES
Proc, Intl Atomic Energy Agency Symp on Isotopes in Hydrol, Vienna, Austria, pp 191-206, 1967. Ministry of Technol, Stevenage, G B, 16 p, 9 fig, 4 tab, 6 ref, disc
DESCRIPTORS-- *radioactive isotopes/ *water pollution/ suspended solids/ pollution abatement/ water quality/ sewage/ tracers/ sanitary engineering/ *recording systems/ cobalt/ digestion tanks/ sewers/ sewerage/ streamflow/ lithium/ bacteria/ hydrology/ adsorption/ gamma rays/ labels/ seas/ oceans/ instrumentation/ measuring instruments
IDENTIFIERS-- bromides/ nuclear probes/ nuclear engineering/ Great Britain/ foreign research

R202637 67A FLOW OF A STREAM THROUGH A RESERVOIR

If a reservoir is fed from a single source, which is not always pure, the extent to which the inflowing stream mixes with the water in the reservoir is important for the quality of water supplied from the reservoir. This problem was investigated at the Lingese Reservoir, an industrial reservoir with a capacity of 2 million cu m of water, located in the North Rhine-Westphalia District of West Germany. So that varying effects of the stream-water temperatures could be studied in relation to the temperature of the reservoir water, investigations were made during 4 different seasons. The stream was radioactively labeled at its point of inflow to the reservoir and its flow through the reservoir measured in length and depth with geiger counters. In 2 cases, radioactivity of the outflowing water was measured at fixed points. A considerable variety of intermixing phenomena was observed mainly for limnological interest. Results of these seasonal experiments are described in detail. Comparisons were made with simultaneously performed dye and salt experiments, but the 4 seasonal experiments using isotopes were found to be more suitable than the other procedures for investigating limnological processes and evaluating them quantitatively.

R202637 67A

Sauerwein, K
THE FLOW OF A STREAM THROUGH A RESERVOIR
Proc, Intl Atomic Energy Agency Symp on Isotopes in Hydrol, Vienna, Austria, pp 697-719, 1967. Gemeinnutziges Inst, Dusseldorf, W Germany, 23 p, 14 fig, 1 tab, disc
DESCRIPTORS-- *water quality/ reservoirs/ flow/ *limnology/ *radioactive isotopes/ geiger counters/ industrial water/ municipal water/ chemical properties/ investigations/ mixing/ fluid flow/ air temperature/ wind speed/ water/ temperature/ water currents/ experimental data/ density/ thermal conductivity/ *streamflow
IDENTIFIERS-- West Germany/ Lingese Resvr, W Germany/ domestic water/ *evaluation/ biological properties/ foreign research

R202646X67A OPTIMUM DESIGN OF FLASH EVAPORATORS

A simple cost model developed for optimizing the design of flash evaporators can be used as a tool for studying the sensitivity of optimum design to variations of independent economic and physical parameters. For fixed water output, variable annual cost is minimized by varying the number of stages, terminal temperature differential (TTD), and condenser tubing diameter. Variable annual cost is assumed to consist of the variable portion of amortization, steam, and pumping costs; operating cost is assumed to be fixed. The variable amortization cost is assumed to include tubing cost proportional to the tubing area and variable shell cost proportional to the number of stages. Sensitivity of optimum design to the mode of optimization is shown; by allowing tube diameter, number of stages, and TTD to vary, a completely different optimum design is obtained. Results of the application of this cost model to a design study are presented.

R202646X6

Wolberg, J R
ANALYSIS OF THE OPTIMIZATION OF THE DESIGN OF FLASH EVAPORATORS
Desalination, Vol 2, No 3, pp 299-307, 1967. Israel Inst of Tech, Haifa, 9 p, 3 fig, 10 tab, 4 ref
DESCRIPTORS-- *optimum design/ costs/ temperature/ steam/ economics/ heat transfer/ *models/ scale/ corrosion/ fabrication/ fluid flow/ velocity/ water costs/ *demineralization/ *evaporators/ design/ analysis
IDENTIFIERS-- *flash evaporators/ operating costs/ brines/ desalination/ foreign research/ Israel

R202672X67A TOTAL MANAGEMENT OF WATER RESOURCES

Application of the concept of total management of water resources is discussed. Two definitions of the concept are: (1) the highest possible recycling of our available waters and (2) the wisdom and desire to use our water resources so society can choose among alternative investments in su diverse areas as water development, national defense, or urban developmer Inadequate technology, uncertainty as to ultimate goals, and lack of inst tutional capability severely limit application of either concept. Water management cannot fulfill all of society's demands because the demands co flict and their aggregate exceeds the potential water supply. A rational basis for choice is needed, along with maximum flexibility to cope with changes in the services demanded and the priority that society accords them. Total management must be oriented toward planning, responsive to subjective values as well as to purely environmental factors, careful to avoid commitment to possibilities that may not materialize, and continually in search of new technology.

R202672X

Smith, Robert L
TOTAL MANAGEMENT OF WATER RESOURCES
Jour AWWA, Vol 158, No 11, pp 1335-1339, Nov 1967. Office of Sci & Technol, Exec Office of the President, Washington, D C, 5 p, 2 ref
DESCRIPTORS-- *water resources/ water development/ water reuse/ *water management/ water demand/ water control/ planning/ organizations/ urban areas/ optimum use/ costs/ flexibility/ environment/ technology/ ecology multiple purpose projects/ drainage basins
IDENTIFIERS-- Federal agencies/ conservation

R202673X67A REALLOCATION TO MEET WATER REQUIREMENTS

The scope of the water problem in the U S is discussed and reallocation examined as a method of solving this problem. Expanding water requirements for agricultural, municipal, and industrial uses in the U S have been met largely by developing surplus water. Reallocation of water is becoming increasingly necessary as readily available sources are exhausted and surplus water becomes more expensive to develop. The Senate Select Committee on National Water Resources published an estimated consumptive use for the year 2000 of 175,000,000 acre-ft, a 50% increase over 1954. The 17 Western States consume 90% of the water in the U S but have only 25% of the supply. Unless new sources of water are developed or consumptive uses are reduced drastically, projections of water withdrawals for the West cannot be realized. Use of meters on all services and adjustment of water rates to affect economic demand can modify the trend of increasing per capita use. Has 16 references

R202673X67A

Flack, J Ernest
MEETING FUTURE WATER REQUIREMENTS THROUGH REALLOCATION
Jour AWWA, Vol 59, No 11, pp 1340-1350, Nov 1967. U of Colorado, Boulder, 11 p, 2 tab, 16 ref
DESCRIPTORS-- *water requirements/ *water demand/ *water management/ water resources/ water reuse/ bibliographies/ *water rights/ municipal water/ consumptive use (water)/ metering/ cost comparisons/ return flow/ water quality/ industrial water/ water laws/ appropriations/ water metering
IDENTIFIERS-- water shortages/ water transfer/ water use

R202687X67A OHIO RIVER WATER QUALITY CRITERIA

This fourth report of the Aquatic Life Advisory Committee to the Ohio River Valley Water Sanitation Commission establishes new and revised criteria for water quality. Water quality criteria are defined as the requirements of aquatic life which will permit a sustained yield of desired game and commercial fish and maintenance of a well-rounded fish population. Criteria are relatively inflexible since they are based on professional conclusions relating to the biological needs of the organism. Previous recommendations on criteria for dissolved oxygen, temperature, pH, radioactivity, and toxicity are updated. For the first time in this series of reports, the committee has developed recommendations on the protection of aquatic life in mixing zones immediately below waste discharge points. Has 17 references.

R202687X67A

Horton, Robert K
AQUATIC LIFE WATER QUALITY CRITERIA
Environ Sci and Technol, Vol 1, No 11, pp 888-897, Nov 1967. Aquatic Life Advisory Committee, ORSANCO, 10 p, 17 ref
DESCRIPTORS-- water analysis/ *water pollution/ stream pollution/ rivers/ *aquatic life/ bibliographies/ *fish/ fish and wildlife/ dissolved oxygen/ temperature/ pH/ toxicity/ mixing/ waste disposal/ *pollution abatement/ sanitation/ radioactive contamination/ standards/ *water quality/ water resources/ limnology
IDENTIFIERS-- Ohio River/ mixing length/ thermal pollution/ water biology/ aquatic ecology

R202693X67A SPECIFICATIONS--PREPARATION AND USE

Specifications are complex documents which must be thoroughly understood b producers and users so that the resulting product will serve its intended purpose. This 5-part article tells how specifications are conceived, developed, prepared, applied, updated, and revised. Performance, design, and material specifications are discussed, with details spelled out to hel avoid potential disputes. The responsibility and influence of technical organizations such as the ASTM and USASI (United States of America Standards Institute, formerly American Standards Association) are reviewed Although the USASI is now operating as a private organization under the laws of New York State, its organization and bylaws are designed so that eventually it can be operated under a Federal charter. At that time, its position as America's official representative in the International Standards Organization (ISO) and associated groups will be reinforced.

R202693X67

Fleischmann, Walter L
SPECIFICATIONS--THEIR PREPARATION AND USE
Metal Progress, Vol 91, No 4 thru 6, & Vol 92, No 1 & 3, pp 101-104, 86-88 100-102, 71-73, & 101-102, Apr thru July & Sept 1967. General Electric Co Schenectady, N Y, 15 p, 1 photo
DESCRIPTORS-- *specifications/ preparation/ *standards/ codes/ materials/ *supply contracts/ purchasing/ safety/ procurement/ quality control/ management/ *contracts/ contracting
IDENTIFIERS-- accuracy/ American Soc for Test & Mat/ USA Standards Institute

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 1, NUMBER 5
MAY 1968

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Selected Water Resources Abstracts includes abstracts of current monographs, journal articles, translations, and reports. The contents of these documents cover the physical, life, and social science, as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water.

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VOLUME 1, NUMBER 5
MAY 1968

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R202709X68A TECHNICAL MEN IN GOVERNMENT
The Federal Government employs more technical manpower than any other organization in the world. A recent attempt to count the number of Federal installations where these scientists and engineers work only resulted in an estimate that there were thousands of laboratories scattered among 25 Agencies and Departments. Living and working conditions in this immense bureaucracy are indicated. The overriding impression is one of great conformity and an excess of attention to climbing the administrative ladder. Good work is done, but with 80% of the Federal research budget contracted to industry and universities, most technical men in Government spend more of their time on frustrating paper shuffling than professional work.

R202709X68A

Marcson, Simon

TECHNICAL MEN IN GOVERNMENT

Sci Technol, No 73, pp 62-68 & 85, Jan 1968. 6 p, 1 illus, 9 ref

Rutgers--The State University, New Brunswick, N J

DESCRIPTORS-/ *technologists/ *scientific personnel/ administration/ *engineering personnel/ laboratories/ research and development/ industries/ *professional personnel/ universities/ management/ *government employees

IDENTIFIERS--/ *Federal Agencies/ Civil Service Commission/ *careers

R202723 68A PERFORMANCE APPRAISAL INTERVIEW BEHAVIOR
The purpose of performance appraisal is to gain an evaluation of each employee's job performance by examining his capacity for future development rather than by concentrating on his past performance. The performance appraisal interview is a tool whereby management is able to point out the particular acceptable or unacceptable elements of an employee's work or work habits before either the organization or the employee loses too much. The goal of the interview is not to change an individual's personality but to improve his job performance. Effectiveness of the interview depends on the behavior of both the supervisor and the employee. General guidelines for such interviews include suggestions on how to: (1) keep them on a conversational level, (2) provide enough time and a minimum of disturbances, (3) avoid tension by acting natural, (4) listen and talk quietly without being on the defensive, and (5) be relaxed and self-confident. Success or failure should not be judged by the social tone, amount of conversation, or the personality differences exposed. Important factors of the interview are the degree of communication achieved and the clarity of criticism, thus enabling an employee to further improve his work performance.

R202723 68A

Smith, John P

PERSONAL BEHAVIOR IN THE PERFORMANCE APPRAISAL INTERVIEW

Advance Manage J, Vol 33, No 1, pp 56-62, Jan 1968. 7 p

Newark College of Engineering, N J

DESCRIPTORS-/ *behavior (psychology)/ management/ supervision/ time/ psychology/ *personnel management/ employee relations/ human behavior/ efficiencies/ reasoning/ human engineering/ *communications/ environment

IDENTIFIERS-/ listening/ goals/ personality/ *interviews/ *performance/ performance rating/ clarity/ evaluation

ADMINISTRATION AND MANAGEMENT

R202769X67A THE MANAGER'S GUIDE TO SYSTEMS ANALYSIS
Systems analysis, as defined by the authors, is the application of operations research methods to determine whether in any complex mechanism all facets of that mechanism can or will achieve the purpose intended with economy of design and operation. Furthermore, systems analysis requires a clearcut relationship between need and design and between achievement and purpose. The authors have developed a systems analysis checklist to help managers judge the worth of a new system concept. The checklist is not intended to show how to design a system but to enumerate the factors contributing to a good systems design. The checklist questions are divided into 2 groups. The first concerns technical factors external to systems design; the second, internal factors. External factors include establishing need, defining objectives, identifying constraints, and validating assumptions. The internal factors include selecting system elements and evaluating the trade-offs. The systems study is concluded with a final appraisal to determine that internal factors satisfy external factors and how well the system design will function under guidelines established by external factors.

R202769X67A

Block, A C; Broner, M A; Peterson, E L

WHAT'S GOING ON HERE--THE MANAGER'S GUIDE TO SYSTEMS ANALYSIS

Manage Rev, Vol 56, No 12, pp 4-14, Dec 1967. 11 p, 1 illus

Lockheed Missiles & Space Co, Sunnyvale, Calif

DESCRIPTORS-/ *systems analysis/ *operations research/ *methodology/ decision making/ management/ correlation techniques/ requirements/ feedback/ coordination/ analysis/ measurement/ collecting method/ models

IDENTIFIERS-/ *management planning/ *systems engineering/ objectives/ evaluation/ constraints

R202780X67A HOW TO MAKE PEOPLE LISTEN
Clear, effective oral reports are the product of an orderly mind, a knowledge of human behavior, and frequent objective appraisal of results. Formal and informal oral communications are important to the average business day. Confidence and competence in this area not only make each individual's participation in a meeting more effective but are necessary requisites to career advancement. Seven practical suggestions to improve oral communications with coworkers include: (1) evaluate the participants and the occasion to provide direction and focus to the material presented; (2) identify the purposes, listing them in order of importance, and orienting the report to this end; (3) organize and outline the report; (4) make and use efficient notes; (5) create a good self-image by analyzing appearance, grooming, and mannerisms; (6) control the voice for most effective use; and (7) use eye communication and watch for feedback from listeners.

R202780X67A

Guncheon, June

TO MAKE PEOPLE LISTEN

Reprint, Nation's Business, Oct 1967. 4 p

DESCRIPTORS-/ management/ *communications/ values/ analysis/ feedback/ concentration/ coordination/ efficiencies/ work/ *preparation/ applied psychology/ conferences/ motivation/ psychology/ reasoning/ planning/ employee relations

IDENTIFIERS-/ listening/ professional advancement/ reports/ professional development/ *oral reports/ performance/ clarity

AGRICULTURE

R202720X67A NITROGEN FERTILIZER LOSS FROM RUNOFF
An experiment conducted at the Southern Indiana Forage Farm using a rainfall simulator evaluated the effect of surface cover, initial soil moisture content, and surface soil structure on the amount of fertilizer nitrogen lost in surface runoff water. Results indicated that nitrogen losses occurred from ammonium nitrate pellets applied to the surface of either sod or fallow when conditions were such as to produce high rates of surface runoff. While fallow soil may retain surface-applied nitrogen fertilizers better than sod under comparable runoff conditions, erosion losses of organic nitrogen are much more severe. Measured losses of mineral nitrogen in these experiments were low, even at the intense rate of rainfall studied. The greatest loss amounted to only 15% of the applied fertilizer nitrogen after 5 in. of rainfall. However, with the increased usage of nitrogen fertilizers anticipated in the future, nitrogen content of surface runoff water could become a significant contributing factor to nitrate pollution of surface water supplies. Further work is being conducted to evaluate nitrogen losses associated with other nitrogen carriers and other management practices.

R202720X67A

Moe, P G; Mannering, J V; Johnson, C B

LOSS OF FERTILIZER NITROGEN IN SURFACE RUNOFF WATER

Soil Sci, Vol 104, No 6, pp 389-394, Dec 1967. 6 p, 3 fig, 1 tab, 11 ref

Purdue University Agricultural Experiment Station, Lafayette, Ind

DESCRIPTORS-- / *fertilizers/ *nitrogen/ *nitrates/ *rainfall/ raindrops/ rainfall intensity/ runoff/ *surface runoff/ crops/ agronomy/ slopes/ agriculture/ soil science/ infiltration/ soils/ water quality/ stream pollution/ water pollution/ artificial precipitation/ soil moisture

IDENTIFIERS-- / ammonium nitrate/ rainfall simulators

CHEMICAL ENGINEERING

R202753X67A PROTECTIVE COATINGS FOR RIVER STRUCTURES
A 7-yr investigation was conducted in the USSR to find paint and varnish coatings providing long and reliable protection against corrosion of hydraulic equipment. Chlorinated polyvinyl chloride, ethynolic, and epoxy coatings are recommended for preventing corrosion on submerged mechanical equipment. Recommended protective coating systems and costs are given. Tests on antifouling paints indicated that a widely used oil-resin base paint was unsatisfactory and a new chlorinated polyvinyl chloride paint had good antifouling properties. In selecting protective coatings, not only the operating conditions must be considered but also the maintenance and repair conditions during the prescribed service life. The more durable and expensive coatings are economically advantageous under difficult and costly maintenance operations.

R202753X67A

Chesnokov, B S; Gurevich, Yu M; Litvak, M L, et al

PAINT AND VARNISH COATINGS FOR PROTECTING MECHANICAL EQUIPMENT FOR RIVER HYDRAULIC STRUCTURES AGAINST CORROSION

Hydrotech Constr, No 3, pp 243-247, Mar 1967. 5 p, 3 tab

DESCRIPTORS-- / *protective coatings/ *corrosion control/ hydraulic gates and valves/ hydraulic structures/ *maintenance/ materials testing/ mechanical equipment/ *paints/ varnishes/ clams/ epoxies/ costs/ field tests/ durability/ laboratory tests/ organic compounds/ enamels/ metalwork
IDENTIFIERS-- / polyvinyl chloride/ product evaluation/ foreign testing/ USSR/ antifouling coatings

CONCRETE TECHNOLOGY

R202770X68A CEMENT HYDRATION & CONCRETE FORM PRESSURE
The pressure of concrete on forms as affected by cement hydration and individual concrete ingredients was studied. The effect of cement hydration was isolated by comparing form pressures developed by concrete with a similar but nonhydrating mixture having the same plastic properties as concrete. Oil-filled pressure cells were used to measure form pressures. Tests indicate 3- to 4-in. slump concrete does not behave as a fluid for any appreciable time without some outside energizing force such as vibration. The arching action of aggregate is the earliest factor limiting development of form pressure. Hydration of cement was the next factor to limit form pressure; however, revibration substantially increases form pressure until about 4 hr after placement. The nonhydrating mixtures develop higher form pressures than concrete. Water-reducing, set-retarding admixtures only slightly lower form pressures developed by concrete. The duration, magnitude, and location of the vibratory effort are more important than any other factors considered in development of form pressure and should be consistent with form design.

R202770X68A

Ore, Elwood L and Straughan, J J

EFFECT OF CEMENT HYDRATION ON CONCRETE FORM PRESSURE

J Amer Concrete Inst, Vol 65, No 2, pp 111-120, Feb 1968. 10 p, 6 fig, 2 tab, 2 ref, disc

Bureau of Reclamation; Ken R White Co, Denver, Colo

DESCRIPTORS-/ concrete/ concrete mixes/ *concrete placing/ admixtures/ concrete technology/ *forms (concrete)/ laboratory tests/ *pressure gages/ lateral forces/ pressures/ fly ash/ aggregates/ vibrations/ instrumentation/ test procedures/ slump

IDENTIFIERS-/ *cement hydration/ concrete properties/ set-retarding agents

CONSTRUCTION

R202754X67A CONSTRUCTING LARGE DIVERSION TUNNELS
The construction of concrete-lined diversion tunnels at Nurek, Toktogul', and Charvak Hydroelectric Projects in Central Asia is described. The Nurek No 1 and Toktogul' tunnels are horseshoe-shaped; the Charvak tunnel has an 11-m-dia circular section. Geologic conditions at the tunnel sites are described briefly, and details are given on tunneling operations and construction costs. Self-propelled mining equipment has cut labor costs in half and increased the quality and rate of construction. With the present equipment, tunnels of cross sectional area greater than 80 sq m are best driven in 2 stages: the top section first with crown concrete and then the bench section. The construction rate of large tunnels is slow because of concreting operations. Lag in concreting operations results from faulty design and lack of standardized tunnel sections. Standardized tunnel sections would permit mechanization of the lining operation. A horseshoe-shaped section with an extended arch abutment is most suitable, even for pressure tunnels. Horseshoe section tunnels are better suited to 2-stage construction, permit organization of a 2-way traffic system, and can be built more quickly and at lower cost than circular sections.

R202754X67A

Mnatsakanov, L N; Kuperman, V L; Kel'mi, A M

EXPERIENCE IN THE CONSTRUCTION OF LARGE-SECTION HYDRAULIC TUNNELS

Hydrotech Constr, No 3, pp 210-221, Mar 1967. 12 p, 11 fig, 5 tab, 1 ref

DESCRIPTORS-/ *diversion tunnels/ foreign projects/ concrete placing/ *foreign construction/ *tunnel construction/ tunnel design/ tunneling/ *tunnel linings/ tunnels/ reinforced concrete/ engineering geology/ mechanization/ rock excavation/ cross sections/ drilling equipment/ construction costs/ construction
IDENTIFIERS-/ rock properties/ *concrete linings/ Nurek Project, USSR/ Toktogul' Project, USSR/ Charvak Project, USSR/ USSR/ blasting

CONSTRUCTION

R202755X67A CONSTRUCTING UNDERGROUND STRUCTURES
The problems associated with improving methods of constructing underground hydraulic structures in the USSR are discussed. Construction of hydraulic tunnels in the USSR evolved in the 1930's. Problems of planning and designing a lining are examined, and a table is given of basic data on linings of large hydraulic tunnels in the most characteristic rocks. Experience has shown that a horseshoe section is most acceptable for temporary diversion tunnels. Research (hydraulic and structural) being conducted on underground structures in the USSR is discussed. The fastest tunneling rate in the USSR was on the Toktogul' tunnel (796 m long with a face area of 150 sq m), completed in 30 working months. This rate was achieved by opening 6 faces. A specialized organization was formed to do the entire complex of underground construction, and results over the past 5 yr indicate this was a sound decision.

R202755X67A

Kuperman, V L

PROBLEMS OF IMPROVING METHODS OF CONSTRUCTING UNDERGROUND HYDRAULIC STRUCTURES

Hydrotech Constr, No 3, pp 202-209, Mar 1967. 8 p, 2 tab, 3 ref

DESCRIPTORS-/ *underground structures/ underground powerplants/ rock excavation/ *tunneling/ *tunnel construction/ tunnels/ tunnel linings/ construction/ construction costs/ *hydraulic structures/ earthquakes/ diversion tunnels/ hydroelectric powerplants/ foreign construction/ excavation/ tunnel design/ tunnel hydraulics
IDENTIFIERS-/ USSR/ construction methods/ underground openings

DAMS AND HYDRAULIC STRUCTURES

R202757 67A TEHAMA-COLUSA FISH BARRIER
A dual-purpose irrigation and fish spawning channel will be constructed along a 3.22-mi length of the Tehama-Colusa Canal, California. A vertical slide gate device (baffle gate) was developed for cleaning the gravel spawning bed of the canal. The gate can be moved along the length of the canal and positioned in the water to produce a jet of higher velocity flow beneath the gate. A secondary use of the baffle gate is to provide a 5-fps velocity barrier for controlling movements of small fish in the canal. Model tests were made to determine whether this velocity barrier could be maintained without eroding the gravel bed and to determine baffle gate settings to produce the 5-fps velocity barrier for given discharges. A photograph and drawing of the model flume, test data, and a gradation curve of model gravel are included.

R202757 67A

Zeigler, E R

AN ARTIFICIALLY PRODUCED VELOCITY BARRIER FOR CONTROLLING FISH MOVEMENT: TEHAMA-COLUSA CANAL

Bur Reclam Lab Rep Hyd-579, Hydraul Br, Nov 1967. 26 p, 14 fig, 4 tab, 1 ref

Bureau of Reclamation, Denver, Colo

DESCRIPTORS-/ *fish/ irrigation canals/ hydraulic models/ model tests/ *fish handling facilities/ scour/ baffles/ velocity/ channels/ slide gates/ flumes/ jets/ gravels/ canals/ hydraulic structures

IDENTIFIERS-/ Tehama-Colusa Canal, Calif/ *spawning channels/ *fish guiding/ *fish barriers/ salmon

DEMINERALIZATION

R202734X67A REVERSE OSMOSIS DESALTS BRACKISH WATER
Field tests of the POGO reverse osmosis test unit were conducted on brackish water in Midland, Fort Stockton, and Kermit, Texas, and San Diego, California. Brackish water in Texas is high in sulfates and carbonates; San Diego water is high in iron and manganese and virtually saturated with sulfates and carbonates. The POGO unit is described briefly, and details are given on operating procedures, measurements, and test results. The tests in Texas showed reverse osmosis can produce a high quality product water with reasonable recovery from brackish water of high sulfate and carbonate content. Tests at San Diego are still in progress but show reverse osmosis can desalt brackish water of high iron and manganese content with reasonable recovery rates by using control measures. Adjusting feedwater pH below 6 inhibits carbonate scale formation. Carbonate scale can be removed by acid treatment and flushing. Sulfate scale can be inhibited by chemical additives and removed by mechanical means such as flushing. Precipitation of iron and manganese compounds can be inhibited by reducing feedwater pH below 6 and minimizing aeration of feedwater.

R202734X67A

Larson, T J

PURIFICATION OF SUBSURFACE WATERS BY REVERSE OSMOSIS

J Amer Water Works Ass, Vol 59, No 12, pp 1527-1548, Dec 1967. 22 p, 10 fig, 4 tab, 5 ref

General Dynamics Corp, San Diego, Calif

DESCRIPTORS--/ *demineralization/ brackish water/ water supplies/ ground water/ field tests/ scale/ carbonates/ sulfates/ iron compounds/ feed water/ manganese compounds/ membranes/ water analysis

IDENTIFIERS--/ *reverse osmosis/ scale prevention/ scaling/ Midland, Tex/ Fort Stockton, Tex/ Kermit, Tex/ San Diego, Calif/ *POGO unit

DRAINAGE AND GROUND WATER

R202718X67A WATER WELLS IN CORROSIVE ENVIRONMENTS
Some 30,000 irrigation wells are being installed in the Indus Basin Irrigation System of West Pakistan to provide drainage for waterlogged lands and irrigation supplies for cultivated land. Mild steel casings and screens were originally specified, as the ground water analysis did not indicate a corrosion hazard. Within 2 yr, approximately 10% of the first group of wells showed a marked decline in yield caused by corrosion and encrustation of screens. The intensity of the attack was related to sulfate-reducing bacteria. Search for a material to withstand the corrosive environment and still not appreciably affect the overall cost of the well led to selection of fiberglass reinforced epoxy resin pipe. Fiberglass pipe meets or exceeds all established criteria for well casing. About 900 wells have been constructed with fiberglass casing since 1965. No difficulties were encountered in shipping or installation. Although the initial cost of fiberglass casing was about 4 times the cost of mild steel casing, experiences in working with fiberglass and manufacturing advances lowering production costs have eliminated any increase in overall costs of completed wells.

R202718X67A

Smith, Don K

AN ECONOMIC DESIGN FOR WATER WELLS IN CORROSIVE ENVIRONMENTS

Amer Inst Mining, Met Petrol Engs Annu Meeting, Los Angeles, Calif, Pap 67I83, Feb 1967. 9 p, 1 ref

Tipton & Kalmbach, Inc, Denver, Colo

DESCRIPTORS-/ *well casings/ *well screens/ *wells/ irrigation systems/ *drainage wells/ drainage systems/ ground water/ waterlogged land/ glass fibers/ corrosion/ epoxies/ plastics/ plastic tubing/ water analysis/ foreign projects/ economies/ composite materials/ foreign construction

IDENTIFIERS--/ irrigation wells/ Indus Basin, Pakistan/ West Pakistan/ *fiberglass plastic pipes/ plastic pipes/ sulfate-reducing bacteria

R202724X67A ECONOMICS OF TUBE WELL DEVELOPMENT
In preparing for a large program of ground water development in the Punjab area of Pakistan, situations arose in which the choice between 2 or more alternatives was made by analyzing the economic implications of critical hydrologic parameters. Two of these situations are of interest to ground water hydrologists. The first involves basic development policy--whether ground water development should be based on the demand of the economy or the conservation concept of safe yield. The analysis demonstrated that mining of ground water is clearly indicated for areas where alternative supplies are unavailable. The second problem involves integrating hydrologic data into an economic model to determine optimum well design. From an analysis of all pertinent factors, a simple nomograph was derived to determine well specifications onsite during construction. The nomograph can be modified for use in any alluvial terrain.

R202724X67A

Mao, S W; Hildebrand, P E; Crain, C N

THE INTERDEPENDENCE OF ECONOMIC AND HYDROLOGIC CRITERIA IN PLANNING WATER RESOURCES DEVELOPMENT

Amer Inst Mining, Met Petrol Engs Annu Meeting, Los Angeles, Calif, Pap 67I90, Feb 1967. 20 p, 6 fig, 3 tab

Tipton & Kalmbach Inc, Denver, Colo; University of Denver, Colo

DESCRIPTORS--/ water resources/ *ground water/ economics/ water costs/ water development/ project planning/ pumps/ aquifers/ pumping plants/ irrigation/ water table/ *wells/ costs/ well screens/ optimum design/ models/ nomographs/ hydrology/ water yield

IDENTIFIERS--/ Pakistan/ pumping/ *tube wells/ economic evaluation/ water wells

R202745 67A GROUND WATER RECHARGE THROUGH WELLS
During recent years more than 100 million cu m of ground water recharge were injected in over 100 wells in Israel. In wells of limestone-dolomite aquifer, recharge rates exceeded 2 cu m/hr during prolonged uninterrupted periods. Performance of the recharge wells was very satisfactory. Experience showed that recharging a well with free-falling water could have unsatisfactory results because of air being sucked into the well during the process. When the inflow of water stopped, air and water were emitted violently from the well casing. Care must be taken in wells where the limestone aquifer is directly overlain by layers of loose sand. When injected water rose in loose sand and dropped upon stoppage of injection, subsidence of the ground occurred, causing loss of the well. Recommendations are made for adequate injection procedures and well construction, and various types of installations used in the recharge operations are described. Installations differ in cost and injection rates; choice of installation type depends on the need and type of operation. Various techniques are compared, and a proposal is made for a standardized economical installation to be used in wells for pumping and recharging.

R202745 67A

Sternau, R

ARTIFICIAL RECHARGE OF WATER THROUGH WELLS. EXPERIENCE AND TECHNIQUES

Symp Int Union Geod Geophys-Int Ass Sci Hydrol, Haifa, Israel, pp 91-100, Mar 1967. 10 p, 7 fig

DESCRIPTORS--/ *groundwater recharge/ injection/ land subsidence/ air/ aquifers/ limestones/ dolomites/ collapsing/ pore water pressures/ well casings/ pressure distribution/ water table/ hydraulic gradients/ sands/ *wells/ *ground water

IDENTIFIERS--/ Israel/ *artificial replenishment/ pumping/ suction

DRAINAGE AND GROUND WATER

R202747 67A MEASURING HYDRAULIC CONDUCTIVITY
Recent developments for measuring essentially vertical hydraulic conductivity (K) in the zone between soil surface and the water table are discussed. Seepage meters are suitable for measuring K of bottom material (including impedance of clogged surfaces) and local infiltration rates and gradients in spreading basins. A newly developed permeameter-type device enables relatively rapid field measurement of K and the negative soil-water pressure, whereby K undergoes its first reduction. The method is applicable to surface and subsurface soil layers and data are obtained for sorption as well as for desorption. Field experiences with the double-tube method are summarized and certain desirable design and operational features presented. Relatively deep K measurements can be made by determining infiltration rates and gradients at the bottom of auger holes and wells. Fast-reacting piezometers enabling pressure measurement shortly after insertion were developed for this purpose. A brief discussion illustrates how the K data obtained can be used in analytical, analog, or digital models for predicting total flow systems below spreading basins, including infiltration rates or transmission losses from ephemeral streams.

R202747 67A

Bouwer, Herman

FIELD MEASUREMENT OF SATURATED HYDRAULIC CONDUCTIVITY IN INITIALLY UNSATURATED SOIL

Symp Int Union Geod Geophys-Int Ass Sci Hydrol, Haifa, Israel, pp 243-251, Mar 1967. 9 p, 3 fig, 12 ref

U S Water Conservation Laboratory, Phoenix, Ariz

DESCRIPTORS-/ *hydraulic conductivity/ *field permeability tests/ water table/ infiltration/ seepage/ measuring instruments/ *permeameters/ ephemeral streams/ auger borings/ models/ wells/ analogs/ groundwater flow/ *permeability/ porous materials/ fluid flow/ saturation/ ground water/ pervious soils/ field tests/ piezeometers
IDENTIFIERS-/ seepage meters/ *permeability coefficients

R202748 67A FRESH GROUND WATER IN COASTAL AREAS
Information on the hydrogeological conditions of coastal fresh ground waters and their schematic characterization is given. Principles of estimating the development possibilities of coastal fresh ground water (considering salt water encroachment) as applied to concentrated and linear water intakes are presented. Problems of hydrogeological investigations and the sequence of their performance in connection with the exploration and forecasting of fresh ground water resources in coastal areas are discussed.

R202748 67A

Babushkin, V D and Goldberg, V M

HYDROGEOLOGICAL INVESTIGATIONS AND ESTIMATION OF FRESH GROUND WATER RESOURCES IN COASTAL AREAS

Symp Int Union Geod Geophys-Int Ass Sci Hydrol, Haifa, Israel, pp 383-389, Mar 1967. 7 p, 1 ref

All-Union Scientific Research Institute of Hydrogeology and Engineering Geology, Moscow, USSR

DESCRIPTORS-/ *ground water/ *coasts/ *fresh water/ *aquifers/ wells/ salinity intrusion/ field investigations/ groundwater recharge/ salt water barriers/ water yield/ forecasting/ groundwater geology

IDENTIFIERS-/ *hydrogeology/ groundwater management

R202749 67A OPTIMAL YIELD OF AN AQUIFER
The criterion of optimal yield should replace the commonly used concepts of safe yield or mining yield. Optimal yield is a criterion based on: (1) physical characteristics of the aquifer, including natural replenishment and its stochastic nature; (2) economic considerations, including the objective of the considered operation; and (3) features of the water resources system of which the aquifer is a component. The proposed approach for treating the problem of aquifer use is based on a mathematical model and determination of the numerical values or functional form of the decision variables by means of the model solution. The mathematical model includes an objective function and constraints; the planning criterion is the maximization of the objective function subject to all constraints involved. The problem of planning ground water use is formulated with this criterion in mind. The proposed approach is introduced through analysis of a simple model of coastal aquifer, including pumping and recharge installation. The problem of the optimal operation of the system and its solution are given.

R202749 67A

Bear, J and Levin, O

THE OPTIMAL YIELD OF AN AQUIFER

Symp Int Union Geod Geophys-Int Ass Sci Hydrol, Haifa, Israel, pp 401-412, Mar 1967. 12 p, 5 fig, 5 ref

Israel Institute of Technology, Haifa

DESCRIPTORS-- / *aquifers/ *ground water/ models/ groundwater recharge/ mathematical analysis/ *underground water storage/ water management/ hydrology/ *optimum use/ optimum development plans/ *water yield/ wells

IDENTIFIERS--/ safe yield/ pumping/ economic evaluation/ mathematical models/ *groundwater management/ stochastic models/ optimization

R202750 67A GROUND WATER BASIN UTILIZATION
California has initiated utilization studies of ground water basins to develop feasible basin operation plans for providing low cost water with no deterioration of natural resources. The methods and findings from the study of the Los Angeles Coastal Plain are presented. New techniques developed for evaluation include a nonlinear mathematical model to simulate dynamic behavior of a ground water basin. Comprehensive geologic and hydrologic studies provided the data, and a general purpose digital computer was used to develop and test the model. The general procedures for setting up the nodal network and model parameters are given. An online digital plot technique is described for providing graphical output to simplify model testing. A verified model of the ground water basin provides reliable results for evaluating physical feasibility and comparing costs of various management plans. The techniques are adaptable to studies in any area of the world.

R202750 67A

Chun, Robert Y D; Weber, Ernest M; Mido, Kiyoshi W

PLANNED UTILIZATION OF GROUND WATER BASINS: STUDIES CONDUCTED IN SOUTHERN CALIFORNIA

Symp Int Union Geod Geophys-Int Ass Sci Hydrol, Haifa, Israel, pp 426-434, Mar 1967. 9 p, 2 fig, 1 ref

California State Department of Water Resources, Sacramento

DESCRIPTORS-/ water development/ *water management/ water utilization/ water supplies/ *ground water/ groundwater flow/ groundwater geology/ groundwater recharge/ *underground water storage/ digital computers/ costs/ aquifers/ hydrology/ feasibility studies/ basins/ model tests/ benefit-cost ratios
IDENTIFIERS--/ mathematical models/ Los Angeles Coastal Plain/ systems engineering/ *groundwater management

DRAINAGE AND GROUND WATER

R202777X67A STORM RUNOFF FOR GROUND WATER RECHARGE
Extensive study is being done in Israel on use of floodwater to supplement the insufficient water supply. Because only 10% of storm runoff can be stored by surface means, artificial recharge into the ground is being studied in laboratory and field investigations. Laboratory work directed toward correlating parameters such as infiltration velocity, pF curve, and volume and size distribution of pores with saturated-state hydraulic conductivity. Field investigations were conducted on subsoil structural changes as well as seepage tests in small ponds and spreading operations. Results indicate that sediment load resulting in soil clogging is the most serious problem in recharging by either spreading or well injection. Recommendations for further investigations are outlined. Has 15 references.

R202777X67A

Berend, J E; Rebhun, M; Kahana, Y

USE OF STORM RUNOFF FOR ARTIFICIAL RECHARGE

Trans Amer Soc Agr Eng, Vol 10, No 5, pp 678-684, 1967. 7 p, 5 fig, 2 tab, 15 ref

Water Planning for Israel, Ltd; Israel Institute for Technology; Water Planning for Israel, Ltd, Tel Aviv

DESCRIPTORS--/ *runoff/ *surface runoff/ *groundwater recharge/ storms/ infiltration/ settling basins/ spreading basins/ hydraulic conductivity/ sediments/ sand filters/ bibliographies/ suspended sediments/ turbidity/ flocculation/ permeability/ water quality/ percolation/ injection/ alum/ dune sands/ groundwater geology

IDENTIFIERS--/ clogging/ *storm runoff/ *artificial recharge

ELECTRICAL ENGINEERING

R202710 67A CORONA NOISE ON KUMATORI EHV TEST LINE
Corona noise characteristic studies made on the 500-750-kv test line at Kumatori Research Laboratory, Japan, are reported. Measuring methods for corona noise and automatic recording equipment are described. About 4000 measurements of corona noise made on the test line under clear and rainy weather conditions were statistically treated by computer. Radio noise levels of 500-kv overhead transmission lines with conductor configuration and phase spacing similar to this test line are predicted to be 41 db (standard deviation, 3.5 db) in fair weather and 49 db (standard deviation, 6 db) during rainy weather conditions. Has 15 references.

R202710 67A

Nagasaki, Shoji; Mori, Norihiro; Fukuyama, Katsumi

CORONA NOISE CHARACTERISTICS ON THE KUMATORI TEST TRANSMISSION LINE

Sumitomo Elec Tech Rev, No 10, pp 41-48, Oct 1967. 8 p, 15 fig, 5 tab, 15 ref

DESCRIPTORS--/ *electrical coronas/ instrumentation/ *radio interference/ characteristics/ *extra high voltage/ transmission lines/ attenuation/ bibliographies/ test facilities/ test procedures/ high frequency/ noise/ bundled conductors/ weather/ rainfall/ forecasting/ design

IDENTIFIERS--/ Japan/ foreign research/ test transmission lines/ testing equipment/ *electric discharges/ electric conductors

R202711 67A FIELD RESEARCH ON H-V UNDERGROUND CABLE
To assure safe and reliable operation of the 275-kv aluminum-sheathed oil-filled cable system for long-distance underground transmission, field research on cables and their accessories has been conducted since June 1966 at the Kumatori Research Laboratory, Japan. Mechanical properties of the cable such as thermal expansion and contraction, displacement of a joint box in the manhole, and the strain on aluminum sheath caused by a daily loading cycle were measured automatically; information has been obtained on mechanical behavior of such a cable installation. Electrical properties, namely power factor and electrostatic capacity, were measured on the cable joints. These tests show that the dielectric properties of oils (mineral or synthetic) and insulators composed of oil-impregnated deionized water-washed low-cellulose-density papers are fully stable.

R202711 67A

Hata, Haruo; Matsuura, Kenji; Nishino, Isao, et al

FIELD RESEARCH ON 275 KV ALUMINUM SHEATHED OIL-FILLED CABLE FOR LONG DISTANCE UNDERGROUND TRANSMISSION LINES

Sumitomo Elec Tech Rev, No 10, pp 21-31, Oct 1967. 11 p, 22 fig, 5 tab, 8 ref

DESCRIPTORS-/ transmission lines/ *mechanical properties/ contractions/ thermal expansion/ *electrical properties/ power factors/ field tests/ electrostatics/ dielectrics/ aluminum/ *extra high voltage/ *electric cables

IDENTIFIERS-/ *underground cables/ Japan/ *cable sheaths/ insulating oil/ cable terminations/ *buried cables/ oil-filled cables

R202715X67A SKIN EFFECT
Alternating current distribution in a conductor is not uniform throughout its cross section but mainly flows in a thin layer at the surface, a phenomenon called skin effect. Current distribution for various-shaped conductors and the differences occurring in ferromagnetic and nonferromagnetic metals are discussed. The effect that current frequency and conductivity of metals has on the theory of skin effect is studied in detail. The skin effect in metals that are superconducting is discussed. A simple model of the superconductor is the 2-fluid model in which a fractional part of the electrons is superconducting and the remainder normal. In this model the superconducting electrons are responsible for the screening effect, even at zero frequency, while the normal electrons in the skin layer thus formed are responsible for the adsorption that occurs only at nonzero frequencies. Has 58 references.

R202715X67A

Casimir, H B G and Ubbink, J

THE SKIN EFFECT

Philips Tech Rev, Vol 28, No 9, 10, & 12, pp 271-283, 300-315, 366-381, 1967. 45 p, 40 fig, 8 tab, 58 ref

DESCRIPTORS-/ *alternating currents/ high frequency/ magnetic fields/ *ferromagnetism/ bibliographies/ *electric fields/ electrons/ theory/ *electrical conductance/ *electromagnetism/ magnetic induction/ electric cables/ electrical engineering/ research and development/ electric currents/ transmission (electrical)/ electric wires
IDENTIFIERS-/ superconductors/ *electric conductors/ foreign research/ Netherlands/ *skin effect (electrical)

R202716X68A PILOT WIRE CABLE PROTECTION FOR RELAYING
Pilot wire cables used for high-speed tone and a-c pilot wire relaying are subject to induced voltage transients which can cause false relaying of transmission circuits. Human errors can cause a pilot wire relaying scheme to malfunction, but most troubles are directly related to the neighboring transmission circuit. Years of experience at Gulf States Utilities have led to a practical protective scheme which insures system success. During the last few years a large number of tone-type transfer trip terminals using both underreaching and overreaching relay schemes have been applied to subtransmission systems. The carrier spectrum is crowded, and carrier relaying is used primarily on 138-kv transmission systems. With the introduction of 500 kv and a need for carrier spectrum space, the 138-kv use of carrier is being replaced by microwave relaying. Tone-type relaying schemes are the only salvation where pilot wire relaying schemes cannot be used. The relaying schemes and test procedures are described. Protective measures are listed, and transfer trip tone-type relaying is discussed.

R202716X68A

Baumgartner, E A

TRANSIENT PROTECTION OF PILOT WIRE CABLES IS ESSENTIAL FOR RELIABLE OPERATION

Transmission Distribution, Vol 20, No 1, pp 80-85, Jan 1968. 6 p, 3 fig, 3 ref

Gulf States Utilities Co, Beaumont, Tex

DESCRIPTORS-/ *electric relays/ transmission lines/ electric potential/ transients/ electric power/ electric motors/ *reliability/ economics/ electric currents/ electrical engineering/ electric insulation/ inductance/ electromagnetic shielding/ electrostatics/ electromagnetic properties/ microwaves/ communications/ powerline carriers
IDENTIFIERS-/ *protection (electrical)

R202717X68A SHIELD-WIRE LOCATION AFFECTS PROTECTION
Location of shield wires on transmission lines, and the wind direction of electrical storms affect the degree of protection from flashovers. Studies suggest that winds influencing cloud movement toward a line can blow a leader lightning stroke or propel ionized clouds toward a line and reduce protective effects of the overhead ground wire by increasing its shielding angle to a point where the ground wire is no longer effective. A study of outages caused by electrical storms on 2 adjacent double-circuit transmission lines is presented. The operating record of a 138-kv, double-circuit transmission line using 2 overhead ground wires spaced for a negative shielding was unusually good in an area with an isoceraunic level of 50.

R202717X68A

Lindell, C H

SHIELD-WIRE LOCATION AFFECTS LINE PROTECTION

Transmission Distribution, Vol 20, No 1, pp 68-71, Jan 1968. 4 p, 5 fig

Cincinnati Gas & Electric Co, Ohio

DESCRIPTORS-/ *transmission lines/ design/ *lightning/ thunderstorms/ wind (meteorology)/ extra high voltage/ ionization/ transmission towers/ clouds/ costs/ *shielding/ electric power failures/ electrical engineering/ electrical grounding

IDENTIFIERS-/ *protection (electrical)/ flashover/ lightning protection/ outages/ *overhead ground wire

R202729X68A LOAD-FLOW CALCULATION BY LOSS TECHNIQUES
Loss-minimization techniques applied to load-flow analysis form an effective means of obtaining a desirable voltage solution. In addition, the method offers improvement in convergence, especially important for networks giving rise to ill-conditioned equations. The method described uses the nodal-impedance matrix and minimizes that part of the total real-power losses depending on the generator reactive-power input and transformer tap settings. The reactive-power input and voltages at the generator busbars, together with transformer tap settings, are calculated automatically by the program according to the criterion of minimum loss. In contrast to methods previously employed, the off-nominal turns ratio of the transformers is represented by a superimposed branch current and an injected nodal current; the transformers may be in-phase or phase-shifting. Incorporating the minimization procedures into the iterative process of a general load-flow program is illustrated. A comparison with other methods is given by means of a sample-system study.

R202729X68A

Zollenkopf, K

LOAD-FLOW CALCULATION USING LOSS-MINIMISATION TECHNIQUES

Proc Inst Elec Engs (Engl), Vol 115, No 1, pp 121-127, Jan 1968. 7 p, 5 fig, 3 tab, 10 ref, append

Hamburgische Electricitaets-Werke, Hamburg, W Germany

DESCRIPTORS-/ *electric power/ electric generators/ power transformers/ *electrical networks/ calculations/ alternating currents/ optimum use/ electrical stability/ matrix algebra/ electrical engineering/ electrical properties/ *losses

IDENTIFIERS-/ *load flow/ foreign research/ West Germany/ *power losses/ optimization/ reactive loads

R202730X68A DISTANCE PROTECTION UNDER FAULTS
The protection coverage afforded by earth- and phase-fault distance relays is evaluated in terms of the range of apparent impedances presented to them for which the protection correctly operates and initiates circuit-breaker tripping. A knowledge is required of the effective polar characteristics of relays and the apparent impedance to which the relays respond for specified system-fault conditions. Owing to the wide variation in both of these in practice, the ordinary static characteristics of relays provide only a limited indication of the discriminative properties of distance relays in different applications; however, a method for comprehensive assessment of the relay characteristics is shown. Mho relay performance is described when the relays are used on 132- and 400-kv circuits, and investigation results are summarized. Studies include response to faults within the protected zone and discrimination against external reverse faults, healthy-phase relay operation, and healthy-circuit relay operation on double-circuit-line constructions. Time response of comparators in impedance measurement is introduced, and an explanation is given of the coverage afforded by this protection, directly related to operating time and discriminative properties of the relays.

R202730X68A

Humpage, W D and Kandil, M S

DISCRIMINATIVE PERFORMANCE OF DISTANCE PROTECTION UNDER FAULT OPERATING CONDITIONS

Proc Inst Elec Engs (Engl), Vol 115, No 1, pp 141-152, Jan 1968. 12 p, 20 fig, 8 tab, 10 ref, append

University of Manchester Institute of Science & Technology, Great Britain

DESCRIPTORS-/ *electric relays/ *faults (electrical)/ polarization/ transmission lines/ extra long distance/ extra high voltage/ remote control systems/ characteristics/ electric power/ alternating currents/ electrical engineering/ power transformers/ supervisory control (power)

IDENTIFIERS-/ *protection (electrical)/ foreign research/ Great Britain

R202737X68A DIELECTRIC TESTS FOR EHV TRANSFORMERS
Specific proposals for revision of dielectric tests for ehv power transformers are presented. These new transformer-insulation tests are based on operating and transient voltages to which the transformer will be subjected during service and should lead to improved operating reliability. Impulse and switching surge tests are based on the maximum impulse and switching surge voltages allowed by the lightning arrester to reach the transformer. These test voltages are at least 15% above the lightning arrester protective level. Low-frequency tests are disassociated from transient voltage requirements and related to operating voltage only. Low-frequency test voltages are reduced and their duration is increased. Measurements made during the low-frequency test period must demonstrate that the insulating structure is free of corona during the entire test time, giving assurance of ample design and careful manufacturing. Reductions in test voltages will permit improved reliability and some reductions in transformer size and weight. Has 25 references.

R202737X68A

Kaufman, Richard B and Meador, Jack R

DIELECTRIC TESTS FOR EHV TRANSFORMERS

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-87, No 1, pp 135-145, Jan 1968. 11 p, 2 fig, 4 tab, 25 ref, disc

General Electric Co, Pittsfield, Mass

DESCRIPTORS-/ *dielectrics/ extra high voltage/ *power transformers/ *impulse tests (electrical)/ bibliographies/ test procedures/ electric potential/ *electrical coronas/ standards/ radio interference/ *electric insulation/ reliability/ electric power failures/ bushings

IDENTIFIERS-/ *dielectric properties/ switching surges/ *lightning arresters

R202738X68A POWERLINE CARRIER ON BUNDLED CONDUCTORS
A system of powerline carrier communication, using insulated bundle subconductors and having an attenuation of about 0.1 db/mi at 100 khz, is described. Merits and disadvantages of this unconventional method are discussed. Push-pull coupling to the subconductors of one bundle is shown to exhibit an inherent property of high rejection of substation noise, a feature of particular interest for d-c transmission lines. This system of powerline carrier communication may permit an increase in the number of carrier channels and make carrier operation possible on d-c lines with very long pole spacing, where attenuation of conventional powerline carrier would be prohibitively large. Simplified modal analysis is developed, leading to a practical solution of coupling and transmission problems on 2-, 3-, and 4-subconductor bundles. Further experimental investigations must be made to determine the final performance and cost of such an installation.

R202738X68A

Perz, Matthias C

POWER LINE CARRIER ON INSULATED BUNDLE SUBCONDUCTORS OF DC AND AC TRANSMISSION LINES

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-87, No 1, pp 162-173, Jan 1968. 12 p, 8 fig, 2 tab, 14 ref, 3 append, disc

Ontario Hydro-Research, Toronto, Canada

DESCRIPTORS-/ *powerline carriers/ alternating currents/ attenuation/ direct currents/ transmission lines/ power system operations/ faults (electrical)/ *communications/ analysis/ *bundled conductors/ extra high voltage/ electrical coronas/ radio interference/ investigations/ electromagnetic properties/ ice/ frost
IDENTIFIERS-/ protection (electrical)/ Canada/ foreign research/ *carrier-current/ switching surges

R202739X68A POWER SYSTEM PHASE ANGLE MEASUREMENT
Load rejection tests conducted on nuclear steam generators in the Bonneville Power Administration transmission system during 1966 afforded an excellent opportunity to monitor the characteristic response of the Northwest Power System. An extensive instrumentation program was initiated, including measuring the voltage phase angle existing between the ends of a transmission line. A phase-angle measuring device is described which has a response time of one cycle of the signals whose phase angles are being measured. The device has an adjustable full-scale range which allows high-accuracy readings of small phase-angle changes. An output is provided for continuous, fast response recording of phase-angle changes suitable for use on an oscillograph. Test results using the measuring device are shown.

R202739X68A

Raupach, Richard C and Stemler, Gary E

A FAST RESPONSE INSTRUMENT FOR MEASUREMENT OF POWER SYSTEM PHASE ANGLES

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-87, No 1, pp 187-189, Jan 1968. 3 p, 4 fig, 3 ref

Bonneville Power Administration, Portland, Oreg

DESCRIPTORS--/ *instrumentation/ electric potential/ transmission lines/ characteristics/ disturbances/ electrical stability/ circuits/ electric power/ *phase control/ telemetry systems/ electronic equipment/ solid state physics/ oscillographs/ *electrical networks/ integration/ field tests
IDENTIFIERS--/ load rejection/ Bonneville Power Admn/ *load-frequency control/ power system stability

R202740X68A HIGH-ALTITUDE TESTS ON A GUYED V TOWER
High-altitude impulse and switching surge tests were conducted on a guyed V tower at an elevation of 10,540 ft (3220 m). Tower insulation with bonded and unbonded wood crossarms was tested using 10, 16, and 21 5-3/4- by 10-in. insulators. No tests were made in rain or in the presence of fog, dew, or frost, but a few tests were conducted during a light snow and with snow on the insulators and crossarms. Under the worst conditions of bonded crossarms and positive switching surges, 14 insulators were determined to be adequate for 230-kv operation at 10,000-ft elevation with the tower design tested. Results obtained with up to 21 insulators will provide a guide in the selection of insulators and tower design for use at high altitudes and voltages higher than 230 kv.

R202740X68A

Robertson, Lawrence M; Brownlee, Theodore; Jones, Paul K

HIGH-ALTITUDE IMPULSE AND SWITCHING SURGE TESTS ON A GUYED V TOWER

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-87, No 1, pp 290-294, Jan 1968. 5 p, 7 fig, 3 tab, 3 ref, disc

Public Service Co of Colorado, Denver; General Electric Co, Pittsfield, Mass

DESCRIPTORS--/ *guyed towers/ *impulse tests (electrical)/ transmission towers/ test procedures/ weather/ *electric insulation/ *clearances/ investigations/ electric potential/ safety factors/ ionization/ test facilities/ electrical conductance/ transmission (electrical)

IDENTIFIERS--/ flashover/ *switching surges/ *electrical insulators/ polarity/ electric conductors

R202765X68A HARMONIC CURRENTS ON HVDC LINES
The harmonic voltages impressed by converters on both ends of a hv-dc transmission line result in harmonic current flow that can cause telephone interference. A procedure is presented for calculating this harmonic current in a high voltage direct current transmission line. An analysis is made of a bipolar line, determining the maximum current on the line for the worst phase position of the voltages applied at each end of the line. Terminating impedances are included, and the current phase position and location on the line determined for maximum harmonic currents. Equations for this solution and a sample calculation are given.

R202765X68A

Specht, T R

HARMONIC CURRENTS ON HV-DC TRANSMISSION LINES

Inst Elec Electron Engs Winter Power Meeting, New York, N Y, Pap 68 CP 117-PWR, Jan 28-Feb 2, 1968. 10 p, 4 fig, 1 tab, 4 ref, append

Westinghouse Electric Corp, Sharon, Pa

DESCRIPTORS-/ extra high voltage/ *direct currents/ transmission lines/ electric potential/ electric currents/ radio interference/ *telephones/ *interference/ rectifiers/ filters (electromagnetic)/ analysis/ electric power/ calculations/ characteristics/ converters (electrical)

IDENTIFIERS-- / *harmonics/ accuracy

R202766X68A IEEE REPORT ON CAPACITANCE SWITCHING
The Interrupter Switch Working Group of the IEEE Switchgear technical committee has recommended revisions of the United States of America Standards Institute (USASI) standards C37.30 and C37.34 covering capacitance switching. The proposed guide will aid the proper application of interrupter switches when switching capacitance loads. The 3 general types of capacitor loads which may be switched are static capacitors, cables, and overhead lines. Recommendations for switching capacitor banks are given. However, recommendations applicable to switching cables and overhead lines have not been completed and in the interim manufacturers should be consulted for proper use of their equipment. Proposed additions and revisions to the standards for High Voltage Air Switches are included in this report.

R202766X68A

Baker, C H

REPORT OF WORKING GROUP ON CAPACITANCE SWITCHING WITH INTERRUPTER SWITCHES

Inst Elec Electron Engs Winter Power Meeting, Pap 68 CP 160-PWR, New York, N Y, Jan 28-Feb 2, 1968. 28 p, 1 fig, 2 tab, 3 ref

S&C Electric Co, Chicago, Ill

DESCRIPTORS-/ *standards/ *interrupters/ *electric switches/ electric power/ electrical engineering/ capacitors/ electric cables/ electrical equipment/ transmission lines/ manufacturing/ electric currents/ electric potential/ transients

IDENTIFIERS--/ *recommendations/ application techniques/ performance/ overvoltage/ air switches

R202773X67A TESTS FOR DAMAGING CORONA ON TRANSFORMERS
A proposed standard procedure for corona tests on oil-immersed transformers is presented, and some of the problems in developing such test procedures are discussed. The proposed test method is based on radio influence voltage (RIV) measurements utilizing a radio noise meter coupled to the test winding through a coupling capacitor or the capacitance tap of a bushing. A special tuned circuit is used with the bushing capacitance tap method to minimize attenuation of RIV due to the ratio of bushing capacitances and thus increase the sensitivity of the method. Several problems of corona testing requiring further investigation are discussed.

R202773X67A

Institute Electric Electronics Engineers Committee Report

TESTS FOR DAMAGING CORONA ON OIL-INSULATED POWER TRANSFORMERS

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-86, No 12, pp 1592-1595, Dec 1967. 4 p, 1 fig, 11 ref, disc

DESCRIPTORS-/ *electrical coronas/ *power transformers/ standards/ test procedures/ radio interference/ dielectrics/ sensitivity/ electric insulation/ bushings/ electric currents/ electric potential/ electric power/ attenuation/ instrumentation/ measurement/ damages

IDENTIFIERS-/ *electric discharges/ electrical insulation tests/ testing

R202774X67A PORTABLE SAFETY GROUNDING EQUIPMENT TESTS
The basic principle of safety grounding for the protection of workmen must be complemented by adequate grounding devices. Because of the great importance of these devices their adequacy should be proved by tests whenever (1) their design is changed although the change is an improvement; (2) system condition changes have accumulated beyond previously established limits; and (3) the slightest doubt about the reliability of a particular design has arisen. Test setups were designed to simulate field conditions as closely as possible and the tests made to cover the most severe service requirements. Resistance of test specimens was measured before each test and oscillograms, photographs, and motion pictures were taken. When the test specimen did not fail, although the test circuit time setting was well beyond the expected duty, resistance measurements were made after the test. Representative test results are given.

R202774X67A

Falck, Knute J and Butterfield, Hollis S

PORTABLE SAFETY GROUNDING EQUIPMENT TESTS

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-86, No 12, pp 1579-1582, Dec 1967. 4 p, 5 fig, 1 tab, 1 ref, disc

Philadelphia Electric Co, Pa

DESCRIPTORS-/ *safety/ *power O&M/ *electrical grounding/ electrical equipment/ personnel/ portable/ test procedures/ transmission (electrical)/ substations (electrical)/ oscillographs/ photographs/ electrical resistivity/ measurement/ switchyards (electrical)

IDENTIFIERS-/ switchgear/ electric utilities/ electrical design/ *safety equipment/ electric conductors

ELECTRICAL ENGINEERING

R202775X67A REGULATION OF INTERCONNECTED AREAS
Some factors related to control of generation and power flow on interconnected systems are analyzed. The paper examines criteria for determining effectiveness of regulation within an individual control area. System control error is defined and the relationship to system frequency deviation and to system stored energy is developed. Inadvertent interchange is explored and the relationship to system time error for an area that regulates to zero control error is developed. Conditions are defined under which the algebraic summation of inadvertent interchange around the interconnection would be zero, and operating conditions when this would not be true are identified. The technique used by some control areas of correcting for inadvertent interchange by a unilateral change of net interchange schedule is evaluated. The adverse effect that such unilateral action can have on the inadvertent accounts of other areas is discussed. How the system load-frequency characteristic supplements stored energy changes in accommodating load changes too small to induce governor action is demonstrated. A technique is suggested for coordinated system-wide correction of inadvertent interchange accumulations.

R202775X67A

Cohn, Nathan

CONSIDERATIONS IN THE REGULATION OF INTERCONNECTED AREAS

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-86, No 12, pp 1527-1538, Dec 1967. 12 p, 8 fig, 1 tab, 14 ref, disc

Leeds & Northrup Co, Philadelphia, Pa

DESCRIPTORS--/ electric power/ control systems/ *power system operations/ electric power production/ electric power demand/ economics/ errors/ automatic control/ frequency/ characteristics/ speed regulators/ operations/ transmission (electrical)/ coordination/ scheduling/ *electrical networks
IDENTIFIERS--/ *interconnected systems/ interties/ *power dispatching/ tie lines/ load-frequency control/ system stability (elect)

FOUNDATIONS

R202722X67A BASE FRICTION FOR FOOTINGS
The value of the angle of base friction between concrete and gravel under high normal stresses was investigated. Results were used to design abutments for the Rhine Bridge located near Emmerich and completed in 1965. The tests consisted of model blocks of concrete with a rough base being moved horizontally above and below water level. Great variations of friction coefficients were indicated when the tests were evaluated by the usual method; however, by including the energy attributed to vertical movement of the model blocks during shearing, all test results were reduced to a true angle of base friction. Direct shear tests were carried out with the same test device; considering the energy correction, they yielded a true angle of internal friction equal to the true angle of base friction. A series of triaxial tests with 10-cm-dia samples, in which energy correction was determined from the volume change during shear, leads to approximately the same result. Has 20 references.

R202722X67A

Schultze, E and Horn, A

THE BASE FRICTION FOR HORIZONTALLY LOADED FOOTINGS IN SAND AND GRAVEL

Geotechnique, Vol 17, No 4, pp 329-347, Dec 1967. 21 p, 17 fig, 1 tab, 20 ref

Technische Hochschule, Aachen, W Germany; Rhein-Ruhr-Ingenieurgesellschaft, Dortmund, W Germany
DESCRIPTORS--/ *friction tests/ *friction/ *footings/ internal friction/ *granular materials/ bibliographies/ sands/ gravels/ normal stress/ soil mechanics/ horizontal loads/ roughness/ coefficients/ direct shear/ laboratory tests/ field tests/ triaxial shear/ energy/ *foundations

IDENTIFIERS--/ Germany/ foreign research/ volume change

R202759 67A BEARING CAPACITY OF FOUNDATIONS
Extensions to the Terzaghi and Meyerhof formula for the bearing capacity of shallow foundations are presented. These extensions were made to clarify use of these theories for problems wherein water table and pore pressure conditions affect the bearing capacity of foundations in saturated and partially saturated soils. Different methods for determining the factors of safety for bearing capacity calculations are given, and recommendations are made for use by design engineers. A computer program that will determine bearing capacity is described briefly. The program is based on input information relating to column loads and considers automatically the weight of footings. A flow chart of the program is given. Preliminary test results are shown to confirm the proposed extensions to the established theories.

R202759 67A

Sparks, A D Walsh

FACTORS OF SAFETY AND OTHER ASPECTS RELATING TO THE BEARING CAPACITY OF FOUNDATIONS

Proc Soil Mech Found Eng 4th Reg Conf Africa, Cape Town, S Africa, Vol 1, pp 271-276, Dec 1967. 6 p, 5 fig, 1 tab, 8 ref

University of Cape Town, Rondebosch, South Africa

DESCRIPTORS-- / *foundation bearing tests/ *foundations/ *bearing capacities/ *safety factors/ design criteria/ flow diagrams/ water table/ saturation/ submergence/ pore pressures/ shear stress/ pore water pressures/ cohesion/ internal friction/ capillarity/ footings/ computer programming
IDENTIFIERS-- / foreign research/ South Africa

R202772X67A DYNAMIC TESTING OF FOUNDATION PILES
Dynamic tests were performed on concrete piles cast in situ to determine quality and load-bearing capacity. The first tests conducted were on steel reinforced piles, 9- to 13-m long, cast in boreholes of 40-cm diameter in a deep layer of thick homogeneous clay. The test piles were vibrated by horizontal blows at the top and vibrations of the upper ends were recorded by a vibrograph. In a weakened pile amplitude is much greater and frequency much lower than in an intact one. Tests were also conducted on end-bearing piles. For these tests, vibration was induced by a vertical blow. The test was applied also to slanting piles. Application and reliability of the test method are discussed. The method is only comparative and yields a relative estimate of quality of piles whose absolute load-bearing capacity must be established by a static load test. The tests do produce, at a relatively low cost, instant information about any serious defects in the piles.

R202772X67A

Dvorak, Arnost

DYNAMIC TESTING OF FOUNDATION PILES

Tech Digest, Vol IX, No 11, pp 796-803, Nov 1967. 8 p, 16 fig, 4 ref

Geological and Hydrological Survey, Prague, Czechoslovakia

DESCRIPTORS-- / *piles/ pile bearing capacities/ friction piles/ dynamics/ *pile foundations/ *foundations/ boreholes/ reinforced concrete/ loads/ vibrations/ static tests/ clays/ soils/ quality control/ cast-in-place structures/ bearing piles

IDENTIFIERS-- / in situ tests/ concrete piles/ dynamic loads/ foreign research/ *dynamic tests/ Czechoslovakia/ cast-in-place piles

R202713 67A RADIOISOTOPES EVALUATE FLOW--A REVIEW
In studies of fluid flow radioactive tracers are employed: (1) in experiments designed to provide data for fundamental flow-theory formulation; (2) for measuring flow parameters under well-defined conditions of flow--velocity, volumetric flow rate, and dispersion in flow; (3) for general examination of the characteristics of a flow system with respect to flow patterns and flow paths; (4) for measuring the dilution caused by the dispersion of dissolved or suspended matter; and (5) for the evaluation of process and process-equipment performance by arranging tracer tests which provide residence-time distributions, information on mixing properties, channeling, recirculation, unintended connections, and leakage. Principles of the various methods and practical procedures are discussed. Comparisons with alternative techniques are made, and reported figures on attainable precision and accuracy are cited. Theoretical aspects of the significance and evaluation of tracer investigations of material turnover are discussed, with particular reference to concepts and models used in analyzing residence-time distributions. An attempt is made to discern general trends of development in radiotracer applications, such as use of the obtained information for process control purposes. Lists 192 references.

R202713 67A

Ljunggren, K

A REVIEW OF THE USE OF RADIOISOTOPE TRACERS FOR EVALUATING PARAMETERS TO THE FLOW OF MATERIAL IN PLANT AND NATURAL SYSTEMS

Isotop Radiat Technol, Vol 5, No 1, pp 3-24, Fall 1967. 22 p, 5 fig, 192 ref

Isotope Techniques Laboratory, Stockholm, Sweden

DESCRIPTORS-- / *radioactive isotopes/ *tracers/ flow/ *fluid flow/ oils/ bibliographies/ discharge measurement/ velocity/ solids/ transportation/ groundwater flow/ dispersion/ reviews/ streamflow/ pipelines/ sediments/ sediment transport/ measuring instruments/ radiation measurement/ water measurement/ hydraulics/ hydrology
IDENTIFIERS--/ dosimeters/ radiation measuring equip

R202779 67A TURBULENCE AND DIFFUSION
This paper is an invited special lecture to the 12th IAHR Congress. The problems of turbulent flow and dispersion are reviewed with emphasis on hydraulic engineering. The mean conditions of shear flow and boundary resistance for both boundary layer flow and conduit flow are presented. A summary is given on turbulence measurement techniques and the agreement of airflow with water flow determinations of the distribution of turbulence intensity. The presence of sediment suspensions and other admixtures is shown to modify the turbulence generated by clear fluid flow. Diffusion due to turbulence and velocity gradients is discussed with regard to the dispersion of neutrally buoyant substances in laboratory and natural channels. Density variations are shown to be an effective dispersion mechanism in estuaries. Finally, unresolved hydraulic engineering research problems in turbulence and dispersion are reviewed. Has 45 references.

R202779 67A

Ippen, Arthur T

TURBULENCE AND DIFFUSION IN HYDRAULIC ENGINEERING

Proc 12th Congr Int Ass Hydraul Res, Ft Collins, Colo, Vol 5, pp 152-189, Sept 1967. 38 p, 13 fig, 2 tab, 45 ref

Massachusetts Institute of Technology, Cambridge

DESCRIPTORS-/ hydrodynamics/ hydraulic engineering/ *turbulence/ fluid flow/ *turbulent flow/ *diffusion/ dispersion/ suspended sediments/ boundary layer/ boundary shear/ channels/ *open channel flow/ fluid mechanics/ streamflow/ hydraulic models/ model tests/ bibliographies/ measuring instruments/ estuaries/ reviews/ hydraulics
IDENTIFIERS-/ shear distribution/ flow characteristics/ *diffusion coefficient

R202782X67A LYSIMETER & WATERSHED EVAPOTRANSPIRATION

Approximately 70% of the precipitation in the United States is returned to the atmosphere through evapotranspiration. To obtain a procedure for estimating watershed evapotranspiration, a statistical model was derived for permanent grass lysimeter evapotranspiration using lake evaporation, soil moisture, and precipitation as independent variables. Measured annual lysimeter evapotranspiration was substantially greater than evapotranspiration derived from water budget estimates on small watersheds. Differences in the lysimeter evapotranspiration rate for permanent grass and grain crops were greatest at grain planting time when the ground was bare. Lysimeter evapotranspiration fell to about one-half of normal when hay was cut and recovered to normal in about 1 month.

R202782X67A

Mustonen, Seppo E and McGuinness, J L

LYSIMETER AND WATERSHED EVAPOTRANSPIRATION

Water Resources Res, Vol 3, No 4, pp 989-996, 4th Quart 1967. 8 p, 2 fig, 3 tab, 12 ref

Board of Agriculture, Helsinki, Finland; Agricultural Research Service, Coshocton, Ohio

DESCRIPTORS--/ *lysimeters/ *watersheds/ *evapotranspiration/ crops/ evaporation/ snow/ solar radiation/ soil moisture/ hydrology/ models/ atmospheric precipitation/ statistics

IDENTIFIERS--/ regression analysis/ potential evapotransp/ forests/ hay/ statistical methods/ multiple regression/ hydrologic budget

R202731X67A HEAT BUDGET STUDIES ON THE MADISON RIVER

A study was made to measure the rate of heat loss from the Madison River in Yellowstone National Park in Wyoming to determine effects of radiation, evaporation, and sensible heat exchange on the rate of temperature change of the river. The Madison, receiving heated water from the Firehole and Gibbon Rivers, was considered to be a model river for thermal pollution investigations. The analytical heat budget of a reach of the river was determined and net radiation and heat change in the river were measured. The difference between these 2 measurements was apportioned into evaporation and sensible heat flux by the use of Bowen's ratio. An equation based on net radiation, air and water temperatures, and air and water vapor pressures is given for predicting downstream cooling of rivers.

R202731X67A

Wright, John C and Horrall, Ross M

HEAT BUDGET STUDIES ON THE MADISON RIVER, YELLOWSTONE NATIONAL PARK

Limnol Oceanogr, Vol 12, No 4, pp 578-583, Oct 1967. 6 p, 4 fig, 3 tab, 7 ref

Montana State University, Bozeman

DESCRIPTORS--/ *heat transfer/ thermal radiation/ *temperature/ *heat/ evaporation/ air temperature/ water vapors/ *rivers/ *streams/ water/ diurnal variations/ forecasting/ water surface/ vapor pressures/ wind (meteorology)/ cooling/ reaches (distance)/ water pollution/ hydrology/ limnology
IDENTIFIERS-/ *heat budget/ *thermal pollution/ *water temperature/ Bowens ratio/ Madison River, Wyo/ Rhodamine B/ albedo/ fluorometers

IRRIGATION

R202764X67A GATES FOR AUTOMATIC SURFACE IRRIGATION
Laboratory developments are described of a system for applying water to furrows, border strips or level basins by means of remotely controlled and hydraulically operated field gates in lined or unlined distribution ditches. The system has direct application where water is diverted from a field supply ditch to a level distribution ditch or so-called level-level ditch in which tubes or spiles are installed for furrow irrigation. Such ditches are usually about 12 ft wide, several hundred feet long, and level crosswise and lengthwise. The system has 2 separate control functions. One control utilizes stilling wells, bleeder valves, and a 4-way hydraulic valve to regulate slide or swing gates designed for fail-safe reasons to maintain a constant depth of water either upstream or downstream from the gate in question. The other control consists of a feature that overrides the above hydraulic system to close the gates to the lateral distribution ditch when sufficient water has been applied. Components of the system and their arrangement in the system are described.

R202764X67A

Haise, H R and Whitney, P L

HYDRAULICALLY CONTROLLED GATES FOR AUTOMATIC SURFACE IRRIGATION

Trans Amer Soc Agr Engs, Vol 10, No 5, pp 639-644, 1967. 5 p, 6 fig, 4 ref

U S Department of Agriculture, Ft Collins, Colo

DESCRIPTORS--/ *automatic control/ automation/ irrigation systems/ slide gates/ irrigation/ *surface irrigation/ *hydraulic gates and valves/ sensors/ pressure sensors/ stilling wells/ ditches/ canals/ laterals/ turnouts/ control structures/ irrigation canals

IDENTIFIERS--/ tubes/ hydraulic valves

MATERIALS ENGINEERING

R202719X68A MATERIALS FOR DOMESTIC WATER PIPE SYSTEMS
The properties and corrosion resistance of materials used in domestic water pipe systems are discussed. Materials include cast iron, ductible cast iron, steel, asbestos cement, plastic, copper, and prestressed concrete cylinder pipe. No single pipe material is perfectly suited to every environment or water supply, and the designer must evaluate all available materials. Recognizing the problems of evaluating materials, the California Section of the American Water Works Association established a Materials Performance Committee in 1965 to develop information on the use and performance of pipe materials. A questionnaire was sent to each member of the California Section. A summary of the replies is given with a more detailed evaluation of cast iron and asbestos cement pipe.

R202719X68A

Wilson, Harold E

PERFORMANCE OF CONSTRUCTION MATERIALS FOR DOMESTIC WATER PIPING SYSTEMS

Mater Protect, Vol 7, No 1, pp 24-28, Jan 1968. 5 p, 3 tab, 10 ref

Long Beach Water Department, Calif

DESCRIPTORS--/ *water pipes/ water supply systems/ *materials/ cast iron/ steel pipes/ asbestos cement/ pipes/ plastics/ plastic tubing/ copper tubing/ epoxies/ corrosion/ linings/ mortars/ corrosion control/ joints/ protective coatings/ polyethylenes/ design criteria/ *municipal water

IDENTIFIERS--/ ductile cast iron/ fiberglass plastic pipes/ product evaluation/ underground corrosion/ polyvinyl chloride

MATERIALS ENGINEERING

R202725 67A CORROSION OF LOW-ALLOY STEELS IN BRIDGES
The New Jersey State Department of Transportation is conducting a study on the performance of unpainted, low-alloy steel bridges. Sufficient data are available in published corrosion tests to permit a reasonable estimate of the amount of corrosion that will occur to unstressed sample panels of many low-alloy steels, freely exposed to the atmosphere under various conditions and at numerous locations. These estimates can be made by comparing the chemical composition of a given steel with steels having a similar percentage of the major corrosion-reducing alloying elements; comparisons must be made for similar environments and test conditions. A tentative empirical method is proposed for predicting the depth of corrosion penetration of bridge members. This method assumes a linear long-term corrosion rate and includes exposure, pitting, and safety factors. Reduction in cross sectional properties of several structural members is discussed. The possible effects of loads on corrosion and corrosion on static and fatigue load resistance are discussed; other factors of relevance to the use of unpainted bridges are listed. A proposed test program for an experimental New Jersey bridge is outlined. Gives 30 references.

R202725 67A
Highway Research Record Committee on Metals in Highway Structures

AN ANALYSIS OF ATMOSPHERIC CORROSION TESTS ON LOW-ALLOY STEELS--APPLICABILITY OF TEST RESULTS TO HIGHWAY BRIDGES

Highway Res Rec, No 204, pp 22-45, 1967. 24 p, 2 fig, 3 tab, 30 ref

State of New Jersey Department of Transportation, Trenton

DESCRIPTORS-/ *materials testing/ *corrosion/ *highway bridges/ metals/ alloys/ *steel/ *bridges/ pitting/ scale/ fatigue (mechanics)/ safety factors/ structural steel/ structural members/ specifications/ exposure/ losses/ test procedures/ bibliographies

IDENTIFIERS--/ *materials engineering/ corrosion resistant alloys/ low alloy steels/ corrosion resistance/ corrosion environments/ New Jersey

MATHEMATICS

R202714X68A THE TREND IN SIMULATION
Simulation is a powerful technique that has been used in the past and will be used in the future to solve important problems. A perfectly valid goal of simulation may be organizing our thinking and knowledge of a problem to permit application of other techniques. Simulation model builders frequently discover that they can predict the results of runs using their models with relatively simple analytical procedures. Consequently, simulation analysts should study optimizing techniques thoroughly to avoid attempting simulation of analytically solvable problems and direct their thinking toward the kinds of solutions which may be most useful and productive. Simulation models should not attempt too much in one leap; massive breakthroughs are likely to produce results which are unverifiable. The author discusses computer modeling of real world processes, a comparison of simulation and laboratory experimentation, advantages of simulation, modeling problems and simulation, validity, and model complexity. Simulation is an extremely valuable tool when used properly to attack problems amenable to simulation; however, it is a wasteful and inappropriate tool when other techniques are available.

R202714X68A
Cremeans, John E

THE TREND IN SIMULATION

Computers Automation, Vol 17, No 1, pp 44-48, Jan 1968. 5 p, 4 fig, 5 ref

Research Analysis Corp, McLean, Va

DESCRIPTORS--/ *simulation/ *mathematical analysis/ *synthesis/ feedback/ *operations research/ *systems analysis/ computers/ feasibility studies/ experimental data/ data processing systems/ statistical analysis/ queueing theory/ probability/ solutions/ computer programming

IDENTIFIERS-/ *problem solving/ *stochastic models/ validity/ *systems engineering/ heuristic methods/ optimization/ variables

MATHEMATICS

R202778X68A PROGRAMMING THEORY AND EDUCATION
A majority of programmers receive their first exposure to programming in a university. The nature of this education is a function of 2 factors: (1) the lack of communication between industry and the university relative to educational requirements of computer professionals, and (2) the university attitude toward programming and programmer's duties as detailed, complex, routine clerical tasks. Programming should be divided into 2 parts: the theory of programs and the theory of programming. A theory of programs should define a program, list its essential elements and interrelationships, and give its characteristic modes of behavior. Similarly, a theory of programming should describe the phenomena, explain the programming process, define the characteristic behavior of the programmer, and identify the influence of programming practice on program cost and quality. The theory emerging from industry is tentative and incomplete. The programming profession vitally needs the theoretical contributions of the university in mathematical optimization, structure of programs, compiler design, and psychology of programming. Therefore, industry and the university must resolve the discrepancies among needs, practice, and education.

R202778X68A

Constantine, Larry L

THE PROGRAMMING PROFESSION, PROGRAMMING THEORY, AND PROGRAMMING EDUCATION

Computers & Automation, Vol 17, No 2, pp 14-19, Feb 1968. 6 p, 5 fig 1 tab, 9 ref

Information & Systems Institute, Inc, Cambridge, Mass

DESCRIPTORS-/ *computer programming/ theory/ professional personnel/ data processing systems/ systems analysis/ *education/ training/ design/ analysis/ preparation/ installation/ maintenance/ instruction/ responsibilities/ universities/ industries

IDENTIFIERS--/ systems engineering/ problem solving/ obsolescence

METEOROLOGY AND ATMOSPHERIC WATER RESOURCES

R202756X67A AUGMENTING WATER SUPPLY BY CLOUD SEEDING
The promising potential for increasing winter precipitation over mountains of the Upper Colorado River Basin is presented in broad perspective. The resulting augmented spring runoff, regulated by existing reservoirs, can provide additional water to meet growing demands for the region where present water supplies are becoming critically short. Increasing the November through April precipitation by 15% over 14,200 sq mi of target areas generally located at elevations above 9500 ft will yield an average additional runoff of 1,870,000 acre-ft annually. This practical capability to enhance the winter snowfall should be developed by the mid-1970's through the $25 million applied research field program outlined in the paper. Exclusive of initial research costs, regular production costs by weather modification are estimated at $1.00 to $1.50 an acre-ft for the new water. Average additional benefits are estimated to be $20 to $25 million annually for a highly favorable benefit-cost ratio of about 10 to 1. Has 19 references.

R202756X67A

Hurley, Patrick A

AUGMENTING UPPER COLORADO RIVER BASIN WATER SUPPLY BY WEATHER MODIFICATION

Amer Soc Civil Engs Annu Nat Meeting Water Resources Eng, New York, N Y, Pap, Oct 1967. 36 p, 7 fig, 2 tab, 19 ref

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ *weather modification/ *cloud seeding/ meteorology/ snow/ water costs/ watersheds/ *artificial precipitation/ feasibility studies/ atmospheric precipitation/ silver iodides/ runoff/ research and development/ benefit-cost ratios/ costs/ nucleation/ bibliographies

IDENTIFIERS--/ *Upper Colorado River Basin/ orographic precipitation/ *induced precipitation/ flow augmentation/ atmospheric research

METEOROLOGY AND ATMOSPHERIC WATER RESOURCES

R202781X67A OPTIMUM DENSITY OF RAINFALL
Techniques of harmonic analysis and concepts of distributed linear systems are used to study the sensitivity of peak catchment discharge to the characteristic spatial variability of convective and cyclonic storm rainfall. Application of the sampling theorem leads to quantitative general relations for optimum rainfall network density for flood forecasting purposes. Specification of network density for the study of long-term, catchment-average rainfall is accomplished by considering the long-term point rainfall as a homogeneous random variable to be sampled spatially. Incorporation of catchment dynamics into the design of flood forecasting networks reduces the number of gages needed when compared with that obtained solely through consideration of precipitation variability. In many studies little advantage is gained by utilizing more than 2 properly located stations for the determination of long-term areal mean rainfall.

R202781X67A

Eagleson, P S

OPTIMUM DENSITY OF RAINFALL NETWORKS

Water Resources Res, Vol 3, No 4, pp 1021-1033, 4th Quart 1967. 13 p, 10 fig, 1 tab, 12 ref

Massachusetts Institute of Technology, Cambridge

DESCRIPTORS--/ *rainfall/ *atmospheric precipitation/ *density/ unit hydrographs/ *networks/ statistical analysis/ watersheds/ discharges/ flood forecasting/ rainfall intensity/ storms/ meteorology/ linear systems/ rain gages/ hydrometeorological station/ hydrology

IDENTIFIERS--/ catchments/ rainfall-runoff relation/ harmonics

PROJECT PLANNING

R202712X68A EFFECT OF NEW RESERVOIR ON LAND PRICE
A statistical analysis of sales records in the Pearl River Reservoir area in Mississippi shows that a sharp increase in market sales price occurred after the official announcement was made of the location and boundaries of the proposed reservoir site. To conduct the research necessary to appraise the effect of the reservoir on surrounding land prices, recorded sales data of land surrounding the reservoir and a control area similar except for the reservoir, were analyzed. The period from 1950 to 1959, when the official announcement was made, was selected to establish a normal trend of sale price per acre in the reservoir area. In the control area, the normal trend of sale price per acre was established from 1950 to 1963. Magnitude of the speculative influence of the reservoir is shown by comparison of actual sale prices of the same parcel of land from 1954 to 1963. The median price trend and resulting differences or percentage of price per acre increase before and after 1959 are charted to show the speculative influence resulting from the reservoir construction.

R202712X68A

Mann, W Merle and Mann, Jack K

ANALYSIS OF THE INFLUENCE OF THE PEARL RIVER RESERVOIR ON LAND PRICES IN THE AREA

Appraisal J, Vol 36, No 1, pp 43-52, Jan 1968. 10 p, 6 fig, 1 tab, 2 ref

Wortman and Mann, Inc, Jackson, Miss

DESCRIPTORS--/ *real property/ *land appraisal/ *reservoirs/ economics/ *appraisals/ values/ statistical analysis/ compensation/ urban areas

IDENTIFIERS--/ effect/ reservoir land value form/ farms/ *prices/ *Pearl River Reservoir, Miss

PROJECT PLANNING

R202727X68A CALIFORNIA'S YUBA RIVER DEVELOPMENT
The Yuba River Development, California, is a multiple-purpose project; its primary functions are conservation and regulation of water for downstream irrigation and municipal use, flood control, hydroelectric power generation, regulation and release of streamflow for maintenance and enhancement of fishlife, and recreation. The 635-ft-high New Bullards Bar Dam, a variable-thickness, double-curvature, monolithic concrete arch structure, is the key unit in the project. Two new powerplants will generate approximately 330 mw of electrical power. River basin hydrology, geology, plan of development, recreational facilities, fish protection and enhancement, and project operation are discussed. Estimated costs for the project and contractors for major permanent equipment are listed.

R202727X68A

Sarkaria, Gurmukh S

CALIFORNIA'S YUBA RIVER DEVELOPMENT

Water Power, Vol 20, No 1, pp 5-16, Jan 1968. 12 p, 12 fig, 3 tab

International Engineering Co Inc, San Francisco, Calif

DESCRIPTORS--/ project planning/ *multiple purpose projects/ *arch dams/ concrete dams/ hydroelectric powerplants/ reservoirs/ recreation/ fish/ flood control/ hydrology/ geology/ design/ construction/ electric power production/ Pelton turbines/ penstocks/ multiple purpose reservoirs/ costs/ contracting/ recreational facilities
IDENTIFIERS--/ *New Bullards Bar Dam, Calif/ *double-curvature arch dams/ Yuba River Basin, Calif/ California/ New Colgate Pwrplt, Calif

ROCK MECHANICS

R202736 67A STRUCTURAL ANALYSIS OF ROCK
The finite element method of structural analysis gives designers a powerful tool to study rock as an in situ building material. With this means of structural analysis, design of rock structures can be resolved into the familiar pattern applied to any structure, but somewhat different procedures and parameters are involved. The method includes the following steps: (1) isolate an appropriate geostructural block containing the opening or excavation from the rock mass for structural analysis; (2) determine the geology of the geostructural block; (3) determine forces acting upon and within the geostructural block; (4) determine mechanical properties of rock; (5) determine stress distribution within the geostructural unit; (6) determine if failure conditions exist; and (7) if collapse conditions exist, determine structural support required to stabilize openings. Each of the steps is discussed and 2 examples (an underground opening and a cut slope) of structural analysis of rock using this method are given.

R202736 67A

Dodd, Jerry S

STRUCTURAL ANALYSIS OF ROCK USING A FINITE ELEMENT METHOD

Intermountain Mineral 3rd Annu Conf, Vail, Colo, Pap, Aug 1967.
53 p, 28 fig, 6 ref

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ *rock mechanics/ *structural analysis/ rock excavation/ safety factors/ *stress distribution/ mathematical analysis/ geology/ numerical method/ elastic theory/ shear strength/ structural engineering/ Mohr envelope/ shear stress/ cut slopes/ laboratory equipment/ design/ design tools/ earthquakes/ models/ *rocks
IDENTIFIERS--/ *finite element method/ in situ rock/ rock joints/ rock pressures/ matrix methods (structural)/ *underground openings

R202726X67A REMOVAL OF MICROORGANISMS FROM WATER
Control and removal of microorganisms from water is an accepted part of the water treatment process to make water aesthetically acceptable and safe for drinking. The presence of bacteria is not the only biological problem in water purification. Other organisms such as viruses, fungi, crustacea, and nematodes are resistant to normal doses of disinfectant and present problems in removal. The paper reviews waterborne diseases, the microorganisms involved, and methods of removal. A review of removal processes includes a discussion of colloids, coagulation, flocculation, adsorption, filtration, and sedimentation. Helminths, cysts, and larger bacteria can be removed by simple sedimentation. The smaller bacteria and viruses can be removed directly by ion exchange or absorption processes, or indirectly by coagulation and flocculation. Coagulation and flocculation are undoubtedly of primary importance; however, very little data are available to determine the significance of these processes. Adsorption is clearly an important process with various degrees of influence on the different unit operations. Adsorption may well be the prime removal process, especially for minute virus particles. Has 116 references.

R202726X67A

Van Duuren, F A

REMOVAL OF MICROORGANISMS FROM WATER

Water Water Eng, Vol 71, No 858, 859, 860, & 861, pp 321-325, 360-363, 414-417, & 454-460, Aug, Sept, Oct & Nov 1967. 20 p, 8 fig, 5 tab, 116 ref
University College, London, Great Britain

DESCRIPTORS-/ *microorganisms/ bacteria/ viruses/ collecting method/ colloids/ adsorption/ sedimentation/ bibliographies/ water analysis/ water filters/ water quality/ *water treatment/ public health/ municipal water/ *sanitary engineering/ sewage treatment/ diseases/ flocculation/ chlorination/ water supplies
IDENTIFIERS--/ double layer/ coagulation/ *separation/ coliforms

R202732X67A ZOOPLANKTON IN OZARK RESERVOIRS
The zooplankton populations of the newly completed Beaver Reservoir before full impoundment are compared with those of the 14-yr-old Bull Shoals Reservoir. Both reservoirs are on the White River in the Arkansas-Missouri Ozarks. Rotifer densities were determined at stations representing lower, middle, and upper main stream areas of each reservoir; samples were pumped from 6-m-depth intervals. Planktonic entomostracan and chaoborus populations were determined from tow net samples. One of the major differences in zooplankton populations is manifested in seasonal pulses of abundance in the new reservoir; the old reservoir shows a unimodal curve and the new reservoir a bimodal curve. Significant seasonal differences between the reservoirs occurred in densities, species composition of cladoceran communities, and horizontal distribution. Mean annual standing crops of entomostracans and rotifers were similar in the 2 impoundments. Comparison of mean annual standing crops does not indicate abnormally high zooplankton production in the new reservoir during stages of filling. Any difference in basic productivity is not reflected in the mean annual standing crop; however, seasonal production differences may influence fish production in the new reservoir. Has 18 references.

R202732X67A

Applegate, Richard L and Mullan, James W

ZOOPLANKTON STANDING CROPS IN A NEW AND AN OLD OZARK RESERVOIR

Limnol Oceanogr, Vol 12, No 4, pp 592-599, Oct 1967. 8 p, 4 fig, 5 tab, 18 ref

Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark

DESCRIPTORS-/ fresh water/ *limnology/ *reservoirs/ bibliographies/ fish and wildlife/ *aquatic life/ *fish/ *plankton/ microorganisms/ sampling/ water quality/ water analysis/ environment/ animals

IDENTIFIERS--/ Bull Shoals Reservoir, Ark/ Beaver Reservoir, Ark/ aquatic populations/ *zooplankton/ rotifers/ standing crop/ reservoir fisheries

R202758 67A LAKE MEAD WATER QUALITY
This report presents Lake Mead water quality data obtained from 1964 to 1966. The effect of filling Lake Powell on the water quality of Lake Mead is evaluated. General limnological principles and the present limnology of Lake Mead are discussed. Lake Mead has a warm monomictic annual temperature cycle characterized by spring overturn, summer stratification, and continuous circulation throughout the winter; temperatures never fall below 39 deg F (4 deg C). During stratification, lower dissolved oxygen values were recorded in the thermocline than in the epilimnion and hypolimnion. Mineral content increases from the upper to the lower end of Lake Mead; the greatest increase is in calcium and sodium sulfates and chlorides, although there is an overall decrease in bicarbonate. Filling of Lake Powell intensified the deterioration of water quality in Lake Mead during 1965, as evidenced by increased temperature, conductivity, and total dissolved solids and decreased dissolved oxygen. Las Vegas Bay reach was found to be a major source for degradation of water quality in Lake Mead because of its large input of dissolved salts and algae nutrients. The monitoring station at Hoover Dam has been a useful indicator of water quality in the lower reach of Boulder Basin.

R202758 67A

Hoffman, Dale A; Tramutt, Paul R; Heller, Frank C

WATER QUALITY STUDY OF LAKE MEAD

Bur Reclam Lab Rep ChE-70, Chem Eng Br, Nov 1967. 115 p, 37 fig, 10 photo, 11 tab, 7 ref, 3 append

Bureau of Reclamation, Denver, Colo

DESCRIPTORS-- / dissolved oxygen/ electrical conductance/ temperature/ chemical analysis/ field tests/ laboratory tests/ field data/ salinity/ *limnology/ reservoirs/ *reservoir surveys/ test procedures/ *water analysis/ water management/ water sampling/ water supplies/ *water quality/ algae/ water pollution/ pH
IDENTIFIERS-- / Lake Mead/ Boulder Canyon Project/ Lake Powell/ *water chemistry/ impoundments/ dissolved carbon dioxide

R202776X67A MISSOURI RIVER WATER QUALITY
Three papers are combined in a report summarizing the development of the Missouri River and planning for water quality controls. The first paper reviews the Missouri Basin hydroelectric flood control, irrigation, municipal water supply, bank stabilization and navigation projects, and discusses the effect of impoundments on water quality. The second paper describes the objectives, planning, and some operational features of the Missouri-Souris-Red River Basins Comprehensive Water Pollution Control Program. These include the STORET computerized water quality data storage and retrieval system, contracted research on a computer model for water quality forecasting, collection of water quality data, and enforcement of water quality standards. The third paper covers protection of the public water supply. Pollution control, waste treatment, riverflow, water quality, and water treatment plants are discussed. Water quality standards should be consistent with 3 general principles: (1) The most important use of the Missouri River is for public water supply; (2) present quality of the water should be improved; and (3) the cost of waste treatment is the responsibility of the polluter, and should not be a burden on the downstream water industry.

R202776X67A

Love, R W; Young, Lewis A; Hartung, H O

WATER QUALITY IN THE MISSOURI RIVER--PROGRESS AND PROSPECTS

J Water Pollut Contr Federation, Vol 39, No 12, pp 1986-2007, Dec 1967. 22 p, 4 fig, 3 tab, 1 ref

Corps of Engineers, Omaha, Neb; Federal Water Pollution Control Administration, Kansas City, Mo; St Louis County Water Co, University City, Mo
DESCRIPTORS-- / water analysis/ water management/ water pollution/ water requirements/ *water quality/ water supplies/ water treatment/ water utilization/ waste water/ sewage treatment/ public works/ *municipal water/ *pollution abatement/ stream pollution/ river basin development/ multiple purpose projects/ planning/ river regulation/ navigation
IDENTIFIERS-- / Missouri River/ *Missouri River Basin/ waste water treatment/ *water pollution control/ Water Quality Act, 1965/ STORET

R202741 67A VIBRATION REDUCES CRITICAL VOID RATIO
A direct shear apparatus was mounted on a shaker table to show the effect of vibration on shear strength and void ratio of dry granular materials. Some work on the effect of vibration on soil properties is reviewed. Modifications of direct shear apparatus and test procedures used for the study are described. Two granular materials, 1/16-in.-dia steel balls and Ottawa sand passing the No 20 and retained on the No 30 sieve, were used in the investigation. The tests indicated that each vibratory equilibrium void ratio was also the critical void ratio when the sample was sheared under the same vibration. Vibratory equilibrium void ratio was defined as the ultimate minimum void ratio for a sample densified at a particular vibration. The critical void ratio and coefficient of internal friction were reduced considerably during vibration.

R202741 67A

Youd, T Leslie

REDUCTION OF CRITICAL VOID RATIO DURING STEADY STATE VIBRATION

Int Symp Wave Propagation Dyn Properties Earth Mater, Albuquerque, N Mex, Pap, Aug 1967. 18 p, 11 fig, 8 ref

Iowa State University, Ames

DESCRIPTORS-- / *vibrations/ *void ratios/ direct shear/ *shear strength/ granular materials/ apparatus/ test procedures/ sands/ critical density/ internal friction/ shear strain/ shear tests/ soil mechanics

IDENTIFIERS--/ vibration tables/ vibration tests/ Ottawa sand/ soil dynamics/ shakers/ strain rate

R202721X67A STRESSES AND STRAINS IN AN ELASTIC LAYER
Burmister's theory was used to obtain a set of influence factors for the stresses and surface displacements of an elastic layer with an underlying rough rigid base. Influence factors for point loading on the surface of the layer have been obtained for 4 values of Poisson's ratio. Corresponding influence factors for line, strip, and sector loading have been calculated by integrating these point load factors. Stresses given in each case are sufficient to define completely the stress distribution at any point in the layer. Accuracy of the influence factors has been examined and found to be quite satisfactory for practical engineering purposes. The sector method, involving superposition of sectors, is described and can be used to calculate stresses and displacements caused by any general shape of loaded area. The classical Boussinesq equations for a homogeneous semi-infinite elastic medium are commonly used to calculate the stresses in a soil mass; however, comparisons reveal that the Boussinesq stresses may be significantly less than the true stresses in a layer, especially near the base of the layer where a marked concentration of stress may occur. Has 21 references.

R202721X67A

Poulos, H G

STRESSES AND DISPLACEMENTS IN AN ELASTIC LAYER UNDERLAIN BY A ROUGH RIGID BASE

Geotechnique, Vol 17, No 4, pp 378-410, Dec 1967. 33 p, 49 fig, 9 tab, 21 ref, 2 append

University of Sydney, Australia

DESCRIPTORS--/ *stress distribution/ *displacements/ bibliographies/ Poisson ratio/ load distribution/ rigid boundaries/ *soil mechanics/ elastic theory/ charts/ stress/ numerical method/ mathematical analysis/ *elastic deformation

IDENTIFIERS--/ Boussinesq equation/ concentrated loading/ elastic foundations/ foreign research/ Australia/ influence lines

R202744 67A SOIL CONSTANTS FROM DYNAMIC TESTING
Several methods of determining the dynamic material constants of soils are described, with special emphasis on the elastic half-space method and the amplitude ratio method. Test results obtained by these various methods are presented to compare each technique and evaluate the various factors influencing the dynamic properties of soils. Factors considered are confining pressure, frequency, amplitude, degree of saturation, shape of footing, and depth of embedment. Comparison of the methods shows agreement in some areas and conflict and uncertainty in others. Tests indicate a variance of wave velocities with the 1/2 to 1/6 power of confining pressure. The effect of amplitude is such that the dynamic moduli are an inverse function of soil deformation induced by the input force. Use of a small- or large-scale vibrator on soils in situ is believed to be the most reliable way of determining the dynamic material constants of soils. Has 23 references.

R202744 67A

Chae, Yong Suk

THE MATERIAL CONSTANTS OF SOILS AS DETERMINED FROM DYNAMIC TESTING

Symp Wave Propagation Dyn Properties Earth Mater, Albuquerque, N Mex, Tech Sess III, Pap, Aug 1967. 32 p, 6 fig, 23 ref

Rutgers--The State University, New Brunswick, N J

DESCRIPTORS--/ soil physical properties/ soil tests/ seismic properties/ dynamics/ soil mechanics/ *elasticity modulus/ bibliographies/ elastic deformation/ *vibrations/ vibrators (mechanical)/ field tests/ wave velocity/ laboratory equipment/ laboratory tests/ triaxial compression/ apparatus/ saturation
IDENTIFIERS--/ Ottawa sand/ *dynamic tests/ confining pressure/ elastic waves/ *soil dynamics/ in situ tests/ *shear modulus/ *shear waves

R202752X67A EARTH PRESSURE ON A RETAINING WALL
The stress state of soil behind retaining structures was investigated by using a large-scale model of a retaining wall under conditions approximating field conditions. The experimental wall was constructed of 8-cm reinforced concrete slabs in the form of a cellular structure 4.25 m high and 1.8 by 3.4 m in plan. Tests were conducted on a natural base of fine grain sand which was also used to create the lateral loads. Earth pressure was measured with a string of dynamometers manufactured and calibrated at the research department of Gidroproekt. The investigation indicated that the magnitude of lateral earth pressure is determined with sufficient accuracy by Coulomb's equation when the retaining wall can yield away from the backfill. When the wall is more stable, stresses in the upper and middle parts of the backfill appreciably exceed those calculated for the active state. Coefficients of lateral earth pressure are calculated for different test conditions and discussed.

R202752X67A

Fil'roze, R M

EXPERIMENTAL INVESTIGATIONS OF EARTH PRESSURE ON A RETAINING WALL

Hydrotech Constr, No 3, pp 268-271, Mar 1967. 4 p, 3 fig, 5 ref

DESCRIPTORS--/ lateral forces/ *earth pressures/ *retaining walls/ soil mechanics/ active pressures/ pressure measuring equip/ *pressure distribution/ pressure gages/ sands/ instrumentation/ backfills/ stress distribution/ model tests/ field tests/ *dynamometers

IDENTIFIERS--/ Coulomb theory/ *at rest pressure/ surcharge

R202760 67A INTERCORRELATION OF SOIL PROPERTIES
The method used and some preliminary results obtained in a study of the relationships among soil properties are presented. The method begins with the classification of different soils in groups according to the degree of response observed when a force is applied. After classification of the soils in groups an attempt is made to define these groups by means of soil properties as determined by accepted standard tests. When an unknown soil is encountered, the standard tests are performed. The soil is grouped with the inference that this soil will respond in a manner similar to other soils in the same group. A statistical analysis was performed on a large volume of test results available from various local organizations. The soil tests, including most of the standard physical properties tests, and the correlation procedures used in the study are given. Preliminary results are tabulated and appear to be promising. The influence of area climate on the maximum Proctor density and CBR value of the soil is illustrated conclusively.

R202760 67A

Van Rooyen, M

INTERCORRELATION OF ENGINEERING PROPERTIES OF SOIL

Proc Soil Mech Found Eng 4th Reg Conf Africa, Cape Town, South Africa, pp 203-207, Dec 1967. 5 p, 4 fig, 2 tab, 11 ref

University of Pretoria, South Africa

DESCRIPTORS-/ *soil physical properties/ correlation techniques/ soil classifications/ statistical analysis/ soil shrinkage/ *soil tests/ dry density/ plasticity index/ liquid limits/ California bearing ratio/ soil mechanics/ moisture content/ gradation analysis

IDENTIFIERS-/ foreign research/ South Africa/ soil groups/ correlation/ soil engineering

R202761 67A STATISTICAL CONTROL OF DRY DENSITY
A simplified statistical approach for the control of dry density in road construction is presented. In the proposed sampling scheme a method is outlined whereby engineering decisions can be made on the number of samples to be tested to satisfy various engineering requirements such as the error in test results and the desired limits of accuracy for a specified probability. Decisions based on the sampling scheme are used to define the requirements for the design, specification, and control of dry density in a road layer. By comparing the average density obtained from the specified number of observations with the specification density, a reliable decision can be made immediately concerning acceptance or rejection of the compacted layer. Criteria for determining the size of the area necessary for the desired number of test observations and the pattern of testing are discussed. An example problem illustrating the statistical control of dry density is given.

R202761 67A

Kuhn, S H and Burton, R W

STATISTICAL CONTROL OF DRY DENSITY

Proc Soil Mech Found Eng 4th Reg Conf Africa, Cape Town, South Africa, pp 191-194, Dec 1967. 4 p, 3 fig, 5 ref

National Institute for Road Research, Pretoria, Africa

DESCRIPTORS-/ *statistical analysis/ *quality control/ *dry density/ construction/ *embankments/ control/ soil compaction/ sampling/ soil mechanics/ soils

IDENTIFIERS-/ *construction control/ foreign research/ Africa/ standard deviation/ statistical quality control

R202762 67A ROCK TYPES AND THEIR DERIVED SOILS
Soils consist basically of material derived from parent rock by either in situ weathering or transportation. Under the correct conditions of climate and drainage resultant material can give rise to pedogenic material such as ferricrete, calcrete and silcrete. An attempt is made to indicate what degree of improvement or impairment in engineering properties can be expected for particular rock types when subjected to the 3 soil-forming processes. The possibility of making similar predictions for a group or a broad division of rocks such as igneous, metamorphic, and sedimentary types is examined. Tables classifying some rock types as roadbuilding materials are given. The conclusion is that a definite pattern of engineering behavior is characteristic for material formed from different divisions of rocks. Has 31 references.

R202762 67A

Floyd, G J

THE ENGINEERING SIGNIFICANCE OF THE RELATION BETWEEN ROCK TYPES AND THEIR DERIVED SOILS

Proc Soil Mech Found Eng 4th Reg Conf Africa, Cape Town, S Africa, pp 121-127, Dec 1967. 7 p, 1 fig, 4 tab, 31 ref

Kantey & Templer, Cape Town, South Africa

DESCRIPTORS-/ *rocks/ sedimentary rocks/ metamorphic rocks/ weathering/ igneous rocks/ soils/ *soil classifications/ transportation/ *materials forming/ *soil physical properties/ base courses/ granular materials/ gravels/ decomposition/ disintegration/ *residual soils/ engineering geology/ geologic investigations/ bibliographies
IDENTIFIERS-/ foreign research/ South Africa/ pedology/ *soil formation/ soil development

R202763 67A HORIZONTAL STRESSES IN LACUSTRINE CLAYS
Conditions of horizontal stress in 2 lacustrine deposits of stiff fissured clay overconsolidated by desiccation are investigated. The first profile is saturated fully with the water table at the surface while the second is in a desiccated and partly saturated condition with a deep water table. References to prior work are given that report values of K sub zero greater than 1 and the horizontal effective stress approaching the passive pressure resistance of a clay. This situation was found to exist in the saturated fissured clay with the water table at the surface. If the clay becomes desiccated because of a lowering water table and if the shrinkage is large as the clay dries out, the horizontal effective stress will decrease. Consequently, horizontal stresses at rest in expansive clays with a lacustrine origin will be lower generally than the minimum passive pressure resistance of the clay, even when the clay has heaved fully beneath a covered surface.

R202763 67A

Blight, G E

HORIZONTAL STRESSES IN STIFF AND FISSURED LACUSTRINE CLAYS

Proc Soil Mech Found Eng 4th Reg Conf Africa, Cape Town, S Africa, pp 95-99, Dec 1967. 5 p, 3 fig, 13 ref

National Building Research Institute, Pretoria, South Africa

DESCRIPTORS-/ *lacustrine deposits/ *clays/ fissures/ stress/ earth pressures/ passive pressures/ effective stress/ *overconsolidation/ soil profiles/ swelling/ soil mechanics/ water table/ saturation/ vane shear tests/ shear tests/ pore pressures/ cohesion/ internal friction/ overburden
IDENTIFIERS-/ *at rest pressure/ foreign research/ South Africa/ slick spot soils

R202767 67A MULCHES FOR GRASS ON STEEP SLOPES
Thirteen mulch treatments were evaluated on plots seeded to Lincoln bromegrass on a 3 to 1 roadside backslope in September 1965. Plots protected with excelsior mat, prairie hay anchored with a loose paper netting, or a combination of emulsifiable asphalt as an anchorage for woodchips, chopped corncobs, prairie hay, or wood cellulose had significantly more grass cover than did the no-mulch treatment 1 month after seeding. Although differences in soil moisture percentages and soil temperatures between mulch treatments were statistically significant, these factors apparently had no great practical effect on seedling grass stands--with one exception. The poor stand of grass on the plots mulched with emulsifiable asphalt may have been due to high soil temperatures and the wide range between soil temperature extremes. The rate of 1200 gal/acre also may have been excessive for good germination. Differences among mulches probably would have been greater under conditions of normal, or preferably below normal, precipitation. The most effective mulches 1 year after seeding were excelsior mat, prairie hay anchored with a light paper netting, and prairie hay anchored with emulsifiable asphalt.

R202767 67A

Dudeck, A E; Swanson, N P; Dedrick, A R

MULCHES FOR GRASS ESTABLISHMENT ON STEEP CONSTRUCTION SLOPES

Highway Res Rec, No 206, pp 53-59, 1967. 7 p, 5 tab, 5 ref

University of Nebraska, Lincoln

DESCRIPTORS-- / *grasses/ *slopes/ *cuts/ *slope protection/ vegetation/ *soil erosion/ erosion/ soil moisture/ temperature/ emulsions/ asphalt/ protective coatings/ soil stabilization/ rainfall/ atmospheric precipitation/ highways

IDENTIFIERS-- / *mulches/ *mulching/ *roadsides/ *slope stability/ hay/ vegetal cover

R202768 67A SLOPE PROTECTION AGAINST WATER EROSION
Mulching practices on a roadside cut with 3 to 1 slope were evaluated for controlling soil erosion and minimizing grass seed and fertilizer loss prior to grass establishment. A field plot rainfall simulator and a device to introduce additional surface flow over a test plot were used to evaluate the mulching practices. Measurements of soil erosion and grass seed and fertilizer losses were made from runoff samples taken through a series of simulated rainstorms. The effectiveness in protecting soil surfaces against water erosion was determined for 13 mulches. The best protection was provided by mulches of jute netting, wood excelsior mat, prairie hay (1 ton/acre) and fiberglass (1000 lb/acre) anchored with asphalt emulsion (150 gal/acre). The least effective mulches were the latex (150 gal/acre) and a kraft paper netting. Anchoring a material with asphalt emulsion provided increased adherence to the soil surface and was generally beneficial.

R202768 67A

Swanson, N P; Dedrick, A R; Dudeck, A E

PROTECTING STEEP CONSTRUCTION SLOPES AGAINST WATER EROSION

Highway Res Rec, No 206, pp 46-52, 1967. 7 p, 1 fig, 4 tab, 3 ref

U S Department of Agriculture; University of Nebraska, Lincoln

DESCRIPTORS-/ *slope protection/ *slopes/ *soil erosion/ grasses/ *cuts/ *erosion/ fertilizers/ soil stabilization/ seeding/ emulsions/ protective coatings/ artificial precipitation

IDENTIFIERS-/ rainfall simulators/ *mulches/ *mulching/ raindrop splash/ simulated rainfall/ *roadsides/ *slope stability/ vegetal cover

SOILS ENGINEERING

R202783 68A SOIL PRESSURE ON BURIED STRUCTURES
An investigation was conducted to evaluate the important variables of the soil-structure interaction problem. This problem has been defined in terms of 2 types of load redistribution: load redistribution between the structure and soil, and pressure redistribution across the structure. A review of literature related to the investigation is given. The experimental model structures used in the investigation were buried in a dry, clean, medium sand. The tests were conducted in an airtight steel cylinder, 8 ft high and 30 in. in diameter, enabling the models to be loaded by air pressure. Pressure redistribution on the structure varied as a function of applied surface pressure and depth of burial, whereas redistribution to the adjacent soil was dependent upon depth of burial alone. Parameters affecting the soil-structure redistribution and structural redistribution were correlated, and the significance of each is discussed. After the pressure redistribution mechanism is established by a seating pressure, which is dependent upon depth of burial, the final attenuation of pressure varies with burial depth for the structural redistribution and with the square root of burial depth for the soil-structure redistribution.

R202783 68A

Linger, Don A and Fernandez, Pedro

SOIL PRESSURE DISTRIBUTIONS ON BURIED STRUCTURES

Pap, 47th Annu Meeting, Highway Res Board, Washington, DC, Jan 15-19, 1968. 41 p, 18 fig, 7 ref

University of Arizona, Tucson

DESCRIPTORS-/ *soil pressures/ *pressure distribution/ instrumentation/ *load distribution/ model tests/ apparatus/ laboratory tests/ structural models/ air chambers/ shear failures/ bending moments/ deformation/ *soil mechanics/ sands/ underground structures/ culverts

IDENTIFIERS-/ *soil-structure interaction/ soil arch/ *buried structures

STRUCTURAL AND ARCHITECTURAL ENGINEERING

R202728X67A DESIGN OF PRESTRESSED CONCRETE MEMBERS
Development of a practical aid for designing standard prestressed concrete members permitting an exact, immediate, and complete graphical design of any uniformly loaded simple span is presented. The graphs visually outline the interaction of all design parameters affecting prestressed concrete; i.e., prestress force, camber, release strength, top tension, bottom tension, deflection at various stages of loading, and ultimate strength. The method developed is general and can be applied to any standard prestressed member. Three design examples are given to illustrate use of the graphs. The method has proven particularly valuable in estimating. Selection of final strand patterns for any span and loading condition can be made without performing a single calculation.

R202728X67A

Jacques, Francis J

GRAPHS FOR THE DIRECT DESIGN OF PRESTRESSED CONCRETE MEMBERS

J Prestressed Concrete Inst, Vol 12, No 6, pp 61-76, Dec 1967. 16 p, 9 fig

Prestressed Concrete of Colorado, Inc, Denver

DESCRIPTORS-/ *prestressed concrete/ design/ *design tools/ *graphical analysis/ codes/ prestressing/ beams/ programs/ concrete/ stressing cables/ tension/ ultimate tensile strength/ charts/ slabs/ structural members/ deflection/ loads/ structural design

IDENTIFIERS-/ camber/ T-beams/ computer printouts/ *ultimate strength design/ concrete properties

R202735 67A NATURE OF PRESTRESSED STEEL STRUCTURES
Principles governing the design, application, construction, and behavior of prestressed steel beams are discussed. Only one type of prestressing is considered, that of using cables, strands, or rods. Several types of prestressed beam structures are considered, including I-shaped, composite, and continuous beams. In each case behavior of the structure is presented, along with comments on the possible economy to be achieved. A comparison is given between conventional and prestressed composite beams, and results show promise for prestressing. Effects of prestressing in significantly reducing bending moments in continuous beam construction are discussed. The moment diagrams for a typical 3-span continuous highway bridge show the magnitude of the reduction that can be realized by using prestressing. Shear is not likely to be any more important in a prestressed structure than in a conventional one. Several examples of existing structures containing prestressed members are given.

R202735 67A

Hoadley, Peter G

THE NATURE OF PRESTRESSED STEEL STRUCTURES

Highway Res Rec, No 200, pp 11-27, 1967. 17 p, 14 fig, 4 tab, 10 ref

Vanderbilt University, Nashville, Tenn

DESCRIPTORS--/ *prestressing/ *steel structures/ *structural members/ design criteria/ structural engineering/ structural design/ *structural steel/ composite structures/ design/ cables/ rods/ beams/ continuous beams/ economics/ bending moments/ building materials/ elastic deformation/ stressing cables/ stress
IDENTIFIERS--/ prestressing systems/ I-beams/ composite beams

R202742X67A FAILURE PROBABILITIES IN DESIGN
The choice of an optimum level of structural safety for 1 type of failure is formulated on the basis of the minimum expected loss criterion applied to an idealized basic scheme. Limits of sensitivity to initial costs are introduced and shown to lead to limits on sensitivity to failure probability. A rigorous decision is compared to an approximate criterion based on effectively zero failure probability for a variety of cases. In many practical situations the simple criterion is at worst a slightly conservative approximation to the formal solution. Gives 15 references.

R202742X67A

Turkstra, Carl J

CHOICE OF FAILURE PROBABILITIES

Proc Amer Soc Civil Engs. J Struct Div, Vol 93, No ST6, Pap 5678, pp 189-200, Dec 1967. 12 p, 1 fig, 5 tab, 15 ref, append

McGill University, Montreal, Canada

DESCRIPTORS--/ *safety/ *probability/ *failure (mechanics)/ *structural design/ bibliographies/ structural engineering/ design/ decision making/ optimum design/ economics/ foreign design practices

IDENTIFIERS--/ Canada

STRUCTURAL AND ARCHITECTURAL ENGINEERING

R202743X67A COMPUTER ANALYSIS OF LARGE FRAMEWORKS
Writing efficient methods of solving simultaneous equations resulting from a linear structural analysis of large frameworks is discussed. Gaussian elimination is considered, and numerous computational variations based on this method are developed. Each method is written to take advantage of some or all of the properties of the stiffness matrix. Solution routines are classed into two distinct groups and use either magnetic tape or need only the working store. The magnetic tape program involves matrix partitioning, performed internally by the computer. Two methods of solution are based on single coefficient eliminations, and two are based on simultaneous elimination of groups of coefficients in the form of submatrix stiffness blocks. Comparisons are made among various methods, and rules are formulated which will permit automatic selection of the appropriate solution routine for a given problem. Has 21 references.

R202743X67A

Brooks, David F and Brotton, Derick M

COMPUTER SYSTEM FOR ANALYSIS OF LARGE FRAMEWORKS

Proc Amer Soc Civil Eng. J Struct Div, Vol 93, No ST6, Pap 5632, pp 1-23, Dec 1967. 23 p, 12 fig, 4 tab, 21 ref, 2 append

University of Manchester, Great Britain

DESCRIPTORS-/ *computers/ frames/ *structural analysis/ structural engineering/ bibliographies/ mathematical analysis/ numerical method/ stiffness/ magnetic tapes/ charts/ *structural design/ digital computers/ computer programming

IDENTIFIERS--/ matrix methods (structural)/ Gaussian distribution/ foreign research/ *space frames/ Great Britain

R202771X68A CELLULAR FLAT PLATE CONSTRUCTION
A relatively new method of concrete flat plate construction using a cellular or hollow design is described. It is distinguished from ordinary waffle slab construction in that a continuous integral bottom sheet of structural concrete completely cellularizes the flat plate. The advantage of cellular construction in reducing deadweight combined with a use of deeper sections makes possible increased span lengths for the same live load as compared to conventional flat plate construction. Spans ranging from 20 to 85 ft using overall plate depths from 14 to 48 in. are possible with this method. Other advantages of the system include a finished ceiling exposed with the stripping of the formwork, slabs with relatively high resistance to heat transmission, good sound damping qualities, elimination of hung ceilings since all required conduits can be embedded, and flexibility in design to support a wide range of loadings. Design and construction techniques used on the system are discussed.

R202771X68A

Hendler, Edgar H

CELLULAR FLAT PLATE CONSTRUCTION

J Amer Concrete Inst, Vol 65, No 2, pp 81-86, Feb 1968. 6 p, 5 fig, 2 tab, 4 ref

George M Ewing Co, Philadelphia, Pa

DESCRIPTORS--/ *cellular structures/ *flat plates/ *concrete structures/ *slabs/ concrete/ *structural engineering/ dead loads/ live loads/ fire safety/ *reinforced concrete/ thermal properties/ conduits/ fillers/ plastics/ building codes/ structural design/ foreign design practices/ acoustic insulation
IDENTIFIERS--/ construction methods/ sound dampers/ plastic foam/ West Germany

R202746 67A PERMEABLE RESERVOIR SITES
A combination surface and underground municipal water supply project is being planned for Pardubice, Czechoslovakia. An artesian basin about 19 km from the city is being developed as a water source but is not sufficient for future requirements. Most of the convenient surface reservoir sites are located on permeable sandstone. In the past, such reservoir sites have been abandoned because of high seepage losses. A new approach to the problem permits utilization of permeable reservoir sites. Hydrogeological investigations showed that the proposed Luz Reservoir would be a natural ground water collection zone for the artesian basin. Investigations are described for determining the feasibility of using the reservoir for surface water storage with the reservoir seepage artificially recharging the artesian basin.

R202746 67A

Zajicek, Vaclav

HYDROLOGICAL DOCUMENTATION FOR THE EXPLOITATION OF RESERVOIRS IN PERMEABLE SOLID ROCKS FOR THE PURPOSE OF ARTIFICIAL INFILTRATION

Symp Int Union Geod Geophys-Int Ass Sci Hydrol, Haifa, Israel, pp 124-131b, Mar 1967. 10 p, 4 fig, 1 tab, 5 ref

Hydraulic Research Institute, Prague, Czechoslovakia

DESCRIPTORS-/ ground water/ groundwater geology/ *groundwater recharge/ engineering geology/ hydrology/ water storage/ *water collection systems/ *water supplies/ subsurface investigations/ seepage/ artesian water/ infiltration/ *underground water storage/ aquifers/ *reservoirs/ foreign projects/ permeability/ feasibility studies
IDENTIFIERS--/ Luz Reservoir, Czech/ Pardubice, Czechoslovakia/ artificial replenishment/ Czechoslovakia

R202751 67A AQUIFER MANAGEMENT
Scarcity of naturally available water resources in many parts of the world points out the need for more sophisticated water management techniques. Rules governing the operation of aquifer and surface water components of regional systems are quite complex. In such cases, optimal operating rules may be derived through the application of systems engineering. Mathematical techniques, collectively termed as operations research, are used for the analysis and solution of problems. The techniques used in optimization include simulation methods and linear, nonlinear, and dynamic programming. Examples of the systems approach to water management in southern California, the Indus Valley, and Israel are discussed. In all cases, the aquifers are viewed as components of complex water systems and use is optimized within the overall system. Application of systems engineering to aquifer management is in the exploratory stage. Further research could refine the analytical techniques used in the management of water resources. Has 33 references.

R202751 67A

Buras, Nathan

SYSTEMS ENGINEERING AND AQUIFER MANAGEMENT

Symp Int Union Geod Geophys-Int Ass Sci Hydrol, Haifa, Israel, pp 466-473, Mar 1967. 8 p, 2 fig, 33 ref

Israel Institute of Technology, Haifa

DESCRIPTORS--/ *water management/ water resources/ operations research/ water sources/ water supplies/ bibliographies/ *water utilization/ reservoirs/ *ground water/ aquifers/ optimum use/ mathematical analysis/ scientific method/ *systems analysis/ foreign projects/ computer programming/ digital computers/ project planning
IDENTIFIERS--/ Israel/ Los Angeles Coastal Plain/ Indus Basin, Pakistan/ mathematical models/ *groundwater management/ *optimization

R202733X68A REMOTE SENSING OF NATURAL RESOURCES

Several devices are now available to supplement the aerial camera in detecting natural resources; e.g., radar, gamma ray detectors, and sensors of infrared energy. The name often given the technique employing these devices is remote sensing. Remote sensing can be done from aircraft or spacecraft, including unmanned satellites. To some extent the data obtained by the sensing devices can be processed and interpreted automatically, permitting a large volume of information to be dealt with rapidly. Remote sensing of natural resources is possible because every feature of the terrain emits or reflects electromagnetic energy at specific and distinctive wavelengths. A discussion on analysis and application of the data obtained from remote sensing is given. Some of the equipment and related devices used by the technique are discussed.

R202733X68A

Colwell, Robert N

REMOTE SENSING OF NATURAL RESOURCES

Sci Amer, Vol 218, No 1, pp 54-69, Jan 1968. 16 p, 5 fig, 43 photo

University of California, Berkeley

DESCRIPTORS--/ *aerial photography/ *natural resources/ *photogrammetry/ geologic investigations/ photographic equipment/ soil surveys/ sensors/ *infrared rays/ gamma rays/ satellites (artificial)/ waves/ radar/ photography

IDENTIFIERS--/ airborne equipment/ *remote sensing/ color photography/ photointerpretation/ photographic analysis/ infrared imagery

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VOLUME 1, NUMBER 6
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CHEMICAL ENGINEERING

R202796X67A CATHODIC PROTECTION OF TURBINES

Corrosion-cavitation damage is one of the main factors determining selection of design and materials for the manufacture of hydraulic turbines, pumps, propellers, and other mechanical equipment washed by a stream of high-velocity fluid. Originally cavitation was thought to result from purely mechanical action of hydraulic shocks upon collapse of cavities in zones of local change of velocities and pressures of the fluid. Analysis of metal behavior in a cavitating flow showed cavitation could not be satisfactorily explained on this basis. However, if metal damage in rapidly flowing fluids is regarded as a complex, combined mechanical and corrosive action, the damage can be explained as corrosion-cavitation. A method to protect impellers and turbine linings against corrosion-cavitation by painting with zinc paint and applying cathodic protection is discussed. This technology of protection is simple and requires no new special equipment or modification of the units. A 3-yr test on unit No 18 of the V I Lenin Volga Hydroelectric Power Station has confirmed high effectiveness of this method of corrosion-cavitation protection.

R202796X67A

Trifel, M S; Shtern, E P; Khanlarova, A G; et al

CATHODIC PROTECTION OF TURBINES AGAINST CORROSION-CAVITATION DAMAGE

Hydrotech Constr, No 2, pp 110-115, Feb 1967. 6 p, 3 fig, 2 tab

DESCRIPTORS-- / *corrosion/ corrosion control/ *cathodic protection/ zinc/ *cavitation/ electric potential/ *hydraulic turbines/ hydrulic machinery/ electrolysis/ electric currents/ protective coatings/ primers (painting)/ polarization/ anodes/ stainless steel/ electrodes/ experimental data

IDENTIFIERS-- / foreign research/ USSR/ *cavitation control/ cavitation resistance/ electrolytic corrosion/ epoxy resins

CIVIL ENGINEERING (GENERAL)

R202793X67A PIPE WITH CONCRETE BEDDING

An analysis of buried concrete pipe embedded in concrete shows that pipe and encasement should be treated as acting together because shear and diagonal tension at the surface of contact between pipe and concrete bedding are generally low. Even the maximum shear in localized areas is not high enough to break the bond, especially since stress normal to the surface of contact is always compressive. Tables are used to extend the solution to different thicknesses of encasement. Encasement thickness also may be different at side and bottom. If the proportions of radius to pipe shell thickness and to thickness of encasement are the same the entire solution can be made by proportioning. Overall conditions of cover and hydrostatic pressure must be considered, and possibly no general statement can be made defining the best proportions for the encasement. In some cases of higher head, full encasement is more desirable than semiencasement; this may also be true for very high earth cover. Critical sections for stress will vary for different combinations of earth and internal pressure, but generally these will be at top and bottom at the vertical centerline and at the sides at horizontal centerline. Overall economics of pipe and encasement must be the ultimate consideration.

R202793X67A

Olander, Harvey C and Robertson, Gordon G

STUDY OF PIPE WITH CONCRETE BEDDING

Amer Soc Civil Engs Nat Meeting Water Resources Eng, New York, N Y, Conf Preprint 573, Oct 1967. 46 p, 14 fig, 8 tab, 5 ref

American Pipe and Construction Co, Monterey Park, Calif

DESCRIPTORS-- / *pipes/ *pipelines/ *bedding materials/ earth pressures/ *concrete pipes/ construction/ fills/ embankments/ high pressures/ vertical loads/ hydrostatic pressures/ shear stress

IDENTIFIERS-- / *pipe laying/ *pipe bedding/ buried pipes/ elastic foundations/ *pipeline design

CIVIL ENGINEERING (GENERAL)

R202797 67A RESERVOIR SHORE PROTECTION
The Novosibirsk Reservoir on the Ob River in western Siberia was subjected to winds of 35 m/sec and wave heights of 2.8 m after being filled in 1959. Portions of the riprap revetment were destroyed leaving the embankment and shoreline vulnerable to scour. To provide protection, an inshore shoalbeach about 6 km long was constructed by hydraulic filling. Width was 180-200 m; thickness 5 to 10 m; and volume 4,730,000 cu m. Slope was 30 to 1. Stability of the artificial beach was studied for 3 yr and data recorded for wave action, sediment movement, reservoir water surface elevation, and beach profile changes. Results indicate that an artificial beach of this type gives effective shore protection.

R202797 67A

Kaskevich, L N and Savkin, V M

ARTIFICIAL BEACH AS AN EXPERIMENTAL TYPE OF RESERVOIR BANK PROTECTION

Hydrotech Constr, No 2, pp 139-142, Feb 1967. 4 p, 3 fig, 4 tab, 4 ref

DESCRIPTORS--/ *beach erosion/ beaches/ *reservoirs/ *bank protection/ riprap/ wind (meteorology)/ *erosion/ waves/ wave action/ hydraulic fills/ turbidity/ sands/ foreign design practices/ stability analysis/ *erosion control

IDENTIFIERS--/ USSR/ wave height/ bedload movement/ Novosibirsk Reservoir, USSR/ slope stability

R202798X67A WATER SURFACES MEASURED BY STEREOGRAPHY
Use of ground stereophotogrammetry provides a way to record instantaneously and to measure later the mutual positions of the characteristic points of the water surface over a large area. The method is based on the intersection principle and permits obtaining space coordinates of any point. The method is described and optimum conditions for use are noted. Four applications of the method are given as used on hydrualic engineering problems in the USSR. These applications include measuring the water surface of a reservoir as it is filled and determining the elevations of the free water surface in a tailrace of a powerplant during spring flood. The average error of determining the water surface elevation of the reservoir on the Vakhsh River was plus or minus 3.4 cm. The method of ground stereophotogrammetry will undoubtedly find further application in hydraulic engineering with the use of additional special equipment.

R202798X67A

Maslovskii, E B and Dement'ev, V E

SOLUTION OF CERTAIN HYDRAULIC ENGINEERING PROBLEMS BY THE GROUND STEREOPHOTOGRAMMETRIC METHOD

Hydrotech Constr, No 2, pp 146-150, Feb 1967. 5 p, 3 fig, 1 tab, 4 ref

DESCRIPTORS--/ *photogrammetry/ *photographic equipment/ photography/ *hydraulic engineering/ *stereoscopic photography/ water surface/ water surface profiles/ hydraulic structures/ hydrologic data/ hydrologic instruments/ tailrace/ hydroelectric powerplants/ reservoir surveys/ theodolites/ hydrology/ surveying
IDENTIFIERS--/ foreign research/ USSR

R202833X68A NEW DRILLING METHODS

Laboratory tests have proven the effectiveness of 25 new drills to drill or break rock. Although few of these drills have undergone full-scale field tests, some are likely to be used in industry within the next 10 yr. The new drills remove rock by 4 basic mechanisms: thermal spalling, chemical reactions, fusion and vaporization, and mechanically induced stresses. Methods using conventional rock bits, such as electrodrills and turbodrills, are not included in this review. Thermal spalling drills heat the rock surface from 700 to 1100 deg F, causing rock to flake. Some of these drills, jet piercing and forced-flame, can drill hard taconite and quartzite faster than conventional drills. Chemical drills have successfully drilled rock in laboratory tests but have limited potential because of cost and problems involved in handling highly reactive chemicals. Fusion and vaporization drills are versatile and can drill any kind of rock, but are limited to low drilling rates. Drills that remove rock by mechanically induced stress can drill any type of rock and operate in a mud-filled borehole. These drills have the greatest potential for drilling oil wells. Has 110 references.

R202833X68A

Maurer, William C

NEW DRILLING METHODS MOVE CLOSER TO FIELD

Oil Gas J, Vol 66, No 9, 10, 11, and 12, pp 74-79, 69-74, 91-98, 85-86, Feb 26, Mar 4, 11, and 18, 1968. 20 p, 30 fig, 4 tab, 110 ref

Esso Production Research Co, Houston, Tex

DESCRIPTORS-- / *drilling/ *drilling equipment/ *drills/ drill holes/ rocks/ boreholes/ bibliographies/ rock excavation/ thermal stress/ fusion/ vaporization/ chemicals/ mechanical waves/ electric arcs/ melting/ heating/ electrons/ laser/ microwaves/ penetration/ explosions/ engineering geology

IDENTIFIERS-- / *rock breakage/ jet piercing/ plasma jet/ ultrasonic drilling

R202856 67A CONSTRUCTION COST OF MUNICIPAL SEWERS

Grants-in-aid for municipal waste treatment works construction were first authorized under the Federal Water Pollution Control Act of 1956 and widely liberalized by Congress in the decade which followed. Commensurately, the dollar volume of construction contracts awarded for these facilities has steadily increased. To accurately assess this increase insofar as it relates to progress in water pollution control, and to estimate the future needs, calls for a thorough understanding of the changing purchasing power of local and Federal funds invested in municipal waste treatment works. These were among the objectives in the Federal Water Pollution Control Administration's development of the sewage treatment plant construction cost index. This report deals with the development of a fixed base, weighted, cost index believed to be a substantially accurate indication of the purchasing power of funds invested in sewage treatment plant construction. This index may be used to evaluate past construction activity and to estimate future sewage treatment plant construction cost requirements for the 20 areas of influence in the United States as well as for the Nation as a whole. Has 33 references.

R202856 67A

Anon

SEWER AND SEWAGE TREATMENT PLANT CONSTRUCTION COST INDEX, CONSTRUCTION COST TRENDS, MUNICIPAL WASTE TREATMENT WORKS AND MUNICIPAL SEWERS

Federal Water Pollut Contr Admin Publ CWT-1, Dec 1967. 59 p, 4 fig, 9 tab, 33 ref, 13 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-- / *sewers/ *construction costs/ sewage treatment/ costs/ waste disposal/ indexes/ sewage works/ waste water/ capital costs/ *sewerage/ sewage disposal/ bibliographies/ waste treatment/ cost analysis/ cost trends/ *municipal wastes

IDENTIFIERS-- / municipal sewers/ cost indexes

R202790X67A SPECIMEN SHAPE AFFECTS TENSILE STRENGTH
The size and shape of concrete specimens inevitably affect direct tensile strength. Cylindrical and prismatic specimens of different sizes but of constant slenderness ratios were tested to determine size and shape effect on such strength. Results indicate, the direct tensile strength decreases as the volume of the specimens increases. The relationship between size and direct tensile strength is given as an exponential function, and is virtually identical for both cylinders and prisms of equal volume. Aggregate size does not influence direct tensile strength as long as the maximum grain size does not exceed a third of the smallest specimen dimension. Tests further indicate direct tensile strength is much less dependent on volume than on slenderness of the specimens. The rapid increase of average tensile strength for smaller specimens can be explained by the higher coefficient of variation encountered in small volumes.

R202790X67A

Spetla, Zdenek and Kadlecek, Vladislav

HOW SIZE AND SHAPE OF SPECIMENS AFFECT THE DIRECT TENSILE STRENGTH OF CONCRETE

Tech Digest, Vol 9, 1967. 8 p, 11 fig, 3 tab, 7 ref

Building Research Institute, Technical University, Prague, Czechoslovakia

DESCRIPTORS-/ concrete/ concrete technology/ *concrete testing/ *tensile strength/ cylindrical bodies/ prisms/ samples/ sizes/ shapes/ laboratory tests/ test procedures/ materials testing/ aggregates/ strength of materials/ volume

IDENTIFIERS-/ foreign testing/ Czechoslovakia/ slenderness ratio/ concrete properties

R202813X68A REACTIVITY OF SAND-GRAVEL AGGREGATES
Field and laboratory studies have shown that sand-gravel aggregates associated with deterioration of concrete in the Kansas-Nebraska region are alkali-silica reactive, while sand-gravels with good service records are not. However, the type of distress observed in the field is not always typical of the distress generally associated with alkali-silica reactivity. Such atypical performance is attributed to severe drying conditions in that part of the country; the resulting concentration and redistribution of alkalies in concrete may bring about reaction with cements of low alkali content. The concrete deterioration is believed due to combined effects of moderate interior expansion, caused by alkali-silica reactivity, and surface shrinkage, caused by unusually severe drying conditions. Has 17 references.

R202813X68A

Hadley, David W

FIELD AND LABORATORY STUDIES ON THE REACTIVITY OF SAND-GRAVEL AGGREGATES

J Portland Cement Ass Res Develop Lab, Vol 10, No 1, pp 17-33, Jan 1968. 17 p, 5 fig, 10 tab, 17 ref, append

Portland Cement Association, Chicago, Ill

DESCRIPTORS-/ *aggregates/ *alkali-aggregate reaction/ bibliographies/ sands/ gravels/ concrete/ *concrete technology/ alkalies/ durability/ portland cement/ cracking/ deterioration/ expansion/ shrinkage/ drying/ limestones/ petrographic investigations/ field investigations/ laboratory tests/ pozzolans

IDENTIFIERS-/ chemical reactions/ mortar bar method/ Kansas/ Nebraska/ *sand-gravel aggregate/ calcium sulfoaluminate

R202792X67A INNOVATIONS IN LAYING AND BEDDING PIPE

New mass production techniques were used in laying approximately 322 miles of pipe of different sizes in the Canadian River Project Aqueduct system in Texas. With a maximum designed capacity of 183 cfs, the system has pipe varying from 96- to 10-in.-id with hydrostatic design heads of 25 to 500 ft. The terrain varies from steep, abrupt, eroded badlands, to relatively flat cultivated land. Conventional methods of pipelaying were abandoned by the contractor after the 1st month, and more efficient and economical procedures were devised. Traveling cradle-cutting machines were developed which excavated the cradle 2 in. below pipe bottom grade. Plastic soil-cement was used for filling the 2-in. space under the pipe. Among other innovations were bell excavating machines attached to power takeoffs of farm tractors. The new pipelaying procedures reduced initial costs by approximately 30%.

R202792X67A

Chappelear, D L and Gloyna, E L

INNOVATIONS IN THE LAYING AND BEDDING OF PIPE

Amer Soc Civil Engs Nat Meeting Water Resources Eng, New York, N Y, Conf Preprint 533, Oct 1967. 26 p, 14 fig, 1 ref, append

Bureau of Reclamation, Lubbock & Amarillo, Tex

DESCRIPTORS-- / *pipes/ *pipelines/ *bedding materials/ *concrete pipes/ earth handling equipment/ aqueducts/ construction/ control structures/ backfills/ trenches/ compaction/ grouting/ hoses/ soil cement/ excavation

IDENTIFIERS--/ *pipe bedding/ *pipe laying/ rigid pipes/ buried pipes/ Canadian River Project, Tex/ *innovation

R202829X68A MORTAR LININGS FOR LARGE STEEL PIPES

The in-place cement mortar lining of large diameter steel water pipes, generally 48 in. in diameter or larger, has become a universally accepted treatment for protecting new pipe from corrosion and tuberculation, and for rehabilitating existing pipelines. The history of cement mortar lining is reviewed and a description is given of the in-place lining method and the lining machine. Installing a lined-in-place pipeline offers advantages in handling a lighter pipe, installation of stulls without danger of damaging previously applied lining, no joints to be manually pointed, and an infrequent need for hand touchups. These factors also have an additional economy in permitting the contractor to install longer pipe sections. The trends in large diameter water pipelines and some recent in-place pipe lining projects are discussed.

R202829X68A

Wolfe, James E

CEMENT MORTAR LINING OF LARGE DIAMETER WATER PIPELINES

Amer Soc Civil Eng Conf, San Diego, Calif, Feb 1968. 18 p, 3 fig, 11 ref

Pipe Linings, Inc, Wilmington, Calif

DESCRIPTORS--/ *water pipes/ *steel pipes/ pipelines/ pipes/ *linings/ portland cement/ *mortars/ protective coatings/ corrosion control/ metal coatings/ mixes/ rehabilitation/ maintenance/ operation and maintenance/ steel linings/ construction/ conduits

IDENTIFIERS--/ *in place pipe linings/ mortar linings (pipes)

R202785X68A OROS SPILLWAY MODEL TESTS

Oros Dam in northeastern Brazil is a 54-m-high earth dam impounding 3.2 million cu m of water. The importance of the structure, unfavorable local siting conditions, and large floodwater spillway capacity required laboratory model tests for design of the spillway and stilling basin. The spillway site has a restricted width presenting serious problems in designing an efficient stilling basin for a heavy discharge. An undistorted 1:100 scale model was selected as the most appropriate. The spillway is a ski-jump type. The nappe is guided to the bucket, flipped forward and upwards, and broken into a fan so as to distribute the mass of water over the widest possible area. The downstream bed is protected from the water impact by a reinforced concrete stake barrier firmly anchored into rock.

R202785X68A

Ottoni Netto, Theophilo B; Junior, Leonino; Tosta de Oliveria, Diney

OROS SPILLWAY MODEL TESTS

Water Power, Vol 20, No 2, pp 67-71, Feb 1968. 5 p, 10 fig

Laboratorio Hidrotecnico Saturnino de Brito S/A, Rio de Janeiro, Brazil

DESCRIPTORS--/ *hydraulic models/ *spillways/ *stilling basins/ energy dissipation/ flood/ foreign projects/ foreign design practices/ model tests/ flip buckets/ baffles/ hydraulic laboratories/ hydraulic structures/ erosion control/ nappe

IDENTIFIERS--/ Oros Dam, Brazil/ Brazil/ *ski-jump spillways

R202799X67A NEW DESIGN METHOD FOR CONCRETE STRUCTURES

A draft "Instructions of Designing Concrete and Reinforced-concrete Hydraulic Structures" was drawn up in 1965 in the USSR to replace existing standards SN55-59. The new instructions standardize methods for design based on limiting states. Sections are included on design of reinforced concrete structures subjected to repeated loads, calculations on the effect of temperature and humidity, reduction of stresses in corrosive zones, and design of precast prestressed structures. The limiting states considered are bearing capacity, deformations and displacements, and the formation or opening of cracks. Design in terms of limiting states systematically accounts for the principal factors involved in structural function by using design coefficients for overload, homogeneity of materials, and service conditions. The paper discusses design of hydraulic structures subjected to repeated loads, cracking, hydrostatic uplift, and placement of transverse reinforcement. The new standardized methods economize on material, increase the reliability and longevity of structures, and unify calculation methods with those used for industrial, civil, and transport structures.

R202799X67A

Shvetsov, A V; Sokolov, I B; Lamkin, M S; et al

THE PRINCIPAL REQUIREMENTS IN NEW STANDARDS FOR THE DESIGN OF CONCRETE AND REINFORCED-CONCRETE HYDRAULIC STRUCTURES

Hydrotech Constr, No 2, pp 152-159, Feb 1967. 8 p, 2 fig, 3 tab

DESCRIPTORS--/ *concrete structures/ *hydraulic structures/ *foreign design practices/ *design standards/ reinforced concrete/ deformation/ reinforcing steel/ precast concrete/ prestressed concrete/ cracking/ uplift pressures/ loads/ bearing capacities/ displacements/ locks/ safety factors/ temperature/ humidity/ structural design
IDENTIFIERS--/ USSR/ repeated loading/ design improvements/ design practices

R202828 68A NEW LOOK AT PENSTOCK ENTRANCE DESIGNS

Experiences with a half-open, fixed-wheel gate covering a penstock bellmouth entrance indicated that conventionally designed penstock bellmouths may be larger than economically justifiable. As the result of a value engineering study of the problem made by the Bureau of Reclamation, a modified entrance structure was designed. A smaller bellmouth and gate were used based on the premise that entrances for low-velocity penstocks need not be as large as those for high-velocity conduits. Hydraulic model tests were used to prove this concept and develop a design for comparison with an existing conventional design. Estimated savings of $13,000,000 in construction costs will be realized when similar bellmouth, gate, hoist, trashrack, and appurtenant structures are used in the new Grand Coulee Third Powerplant penstock entrances. This powerplant, to be added to the existing Grand Coulee Dam, is planned to contain ultimately twelve 600,000-kw units. Hydraulic model tests, made to confirm general hydraulic concepts and to develop an exact bellmouth shape for the Grand Coulee Third Powerplant, indicated that smaller bellmouths were not only economically desirable but could be designed to perform better hydraulically.

R202828 68A

Peterka, Alvin J and Lindholm, Ernest A

A NEW LOOK AT PENSTOCK ENTRANCE DESIGNS

Pap Western Water Power Symp, Los Angeles, Calif, Apr 8-9, 1968. 10 p, 8 fig, 1 tab

Bureau of Reclamation, Denver, Colo

DESCRIPTORS-/ *penstocks/ *entrances/ *hydraulic gates and valves/ stop logs/ laboratory tests/ hydraulic models/ low pressures/ gates/ fixed wheel gates/ head losses/ trashracks/ costs

IDENTIFIERS-/ valve engineering/ Flaming Gorge Dam, Utah/ *cost savings/ Grand Coulee Pwrplt, Wash/ innovation/ bellmouths

R202830 67A THE MALPASSET DAM FAILURE

This report summarizes research by a group of engineers executing the final instructions of Andre Coyne to find causes of this dramatic dam failure. Malpasset Dam failed on Dec 2, 1959. It was the first total failure in the history of arch dams. Examination of the ruins indicated that the arch itself was not to be blamed either in principle or in execution. Failure occurred in the foundation of the entire left abutment. Motivating agent in the failure was pore water pressure in the rock. The pore pressure condition would not have triggered the failure if 3 conditions at the site had not existed: (1) nature of the rock which would normally be satisfactory, (2) geometry of the structure of the rock mass foundation, particularly the foliation, and (3) a fault downstream from the dam. Geology of the site is discussed. A description of the dam before, during, and after the failure is given. Much information was obtained about the failure by examination of blocks from the arch deposited downstream.

R202830 67A

Bellier, Jean

THE MALPASSET DAM

Travaux, Vol 50, No 389, pp 363-383, July 1967. Transl from French, Bur of Reclam Transl 742, Jan 1968. 67 p, 22 fig, 12 photo, 6 ref

DESCRIPTORS-/ *dam failures/ *dam foundations/ geology/ *arch dams/ pore pressures/ geologic investigations/ *concrete dams/ abutments/ foreign construction/ structural behavior/ rock mechanics/ faults (geology)/ rock foundations/ geologic formations/ structural analysis/ deformation/ pore water pressures
IDENTIFIERS-/ Malpasset Dam, France/ rock properties/ foreign research/ geologic defects/ France

DEMINERALIZATION

R202791X68A WATER DESALTING PLANT--KEY WEST, FLORIDA
Completion of the world's largest single-unit, multistage flash evaporation desalting plant, with a capacity of 2.62 million gallons per day, provides Key West, Florida, with the most economical means of supplying water needs for a growing population. Over 50,000 people in the Key West area will be supplied with purified sea water at a plant cost of approximately 85 cents per thousand gallons. A comprehensive study is made of 5 different proposed plans and the reasons given for selecting the present system. A general description of the plant and its principal systems of operation are discussed. Sufficient instrumentation and control equipment have been provided to insure operation under all load conditions with a minimum of operating personnel.

R202791X68A

Anon

THE SEA WATER DESALTING PLANT AT KEY WEST, FLORIDA

Water Water Eng, Vol 72, No 863, Jan 1968. 7 p, 11 fig, 2 tab

DESCRIPTORS--/ *demineralization/ *sea water/ costs/ economics/ *fresh water/ evaporators/ distillation/ condensers (liquefiers)/ wells/ fuel oils/ pipelines/ aqueducts/ water requirements/ cost comparisons/ pH/ instrumentation/ automatic control

IDENTIFIERS--/ *potable water/ multistage flash distill/ brines/ Florida Keys/ flash distillation/ Florida/ scale prevention/ *domestic water

DRAINAGE AND GROUND WATER

R202809X68A WELL LOGGING IN GROUND WATER HYDROLOGY
The Geological Survey is conducting research on the application of borehole geophysics to ground water hydrology. Although most petroleum well logging techniques may be utilized in hydrology, modifications in equipment and interpretation are necessary because of basic economic and environmental differences between petroleum and ground water evaluation. If logging is to be widely applied to ground water exploration and evaluation, the expense of equipment and services must be reduced. Fortunately, this can be done, because most water wells are not as deep as oil wells and the temperatures and pressures are lower. The following logging devices are utilized in the evaluation of ground water environments: spontaneous potential, resistivity, gamma, gamma-gamma, neutron, radioactive tracer, flowmeter, caliper, fluid resistivity, gradient and differential temperature, and sonic velocity. Lightweight logging sondes and control modules are operated by 1 man, either on a vehicle-mounted 6000-ft logger or on a suitcase-mounted 500-ft logger. An inexpensive magnetic tape system has been developed and is used routinely for log recording and playback.

R202809X68A

Keys, W Scott

WELL LOGGING IN GROUND-WATER HYDROLOGY

Ground Water, Vol 6, No 1, pp 10-18, Jan-Feb 1968. 9 p, 8 fig, 12 ref

Geological Survey, Denver, Colo

DESCRIPTORS--/ *wells/ *logging/ *logs/ *ground water/ aquifers/ electric analogs/ models/ measuring instruments/ tracers/ radioactive isotopes/ gamma rays/ isotopes/ neutron counters/ magnetic tapes/ boreholes/ temperature

IDENTIFIERS--/ *groundwater hydrology/ nuclear probes/ *well logging/ gamma probes/ brines

DRAINAGE AND GROUND WATER

R202810 67A GROUND WATER CHANGES DURING IRRIGATION

During 1962-1965 changes in ground water level and mineralization in newly irrigated virgin soils of the USSR Golodnaya Steppe were investigated. Observations of water level and mineralization were made from 3 profiles passing through the study area. Tables and charts are given recording the observed changes. Conclusions drawn were: (1) the ground water rose an average of 2-3 m per yr mainly from percolation of irrigation water on the fields; (2) ground water rose more rapidly in higher elevated irrigated areas and near canals because of uneven distribution of irrigation water resulting from high soil water permeability during the 1st yr of irrigation; (3) an uneven distribution of irrigation water after 5-6 yr of irrigation leads to creation of a desalinized quantity of ground water in the higher areas while highly mineralized ground water rises in the lower areas; (4) to improve the beneficial state of the lower areas and to increase the effectiveness of drainage work, the length of the drainage network must be increased and differential leaching performed. Drains should not be located near canals.

R202810 67A

Molodtsov, V A and Dokuchayev, V V

CHANGE IN GROUNDWATER DEPTH AND MINERALIZATION DURING IRRIGATION OF VIRGIN SOILS OF THE GOLODNAYA STEPPE

Soviet Soil Sci, No 5, pp 679-684, May 1967. 6 p, 2 fig, 3 tab, 13 ref

DESCRIPTORS-/ *ground water/ permeability/ moisture content/ leaching/ *water table/ water quality/ *irrigation/ *salinity/ *salts/ drainage/ percolation/ soil profiles/ loams/ clays/ sands/ minerals/ soluble salts/ sulfates/ chlorides

IDENTIFIERS-/ USSR/ saline soils

ELECTRICAL ENGINEERING

R202816X68A BASIC PRINCIPLES OF PLANNING VAR CONTROL

Study and evaluation of generation, transmission, and consumption of reactive power in a transmission network is a necessary part of power system planning. Kilovars and kilowatts should be provided as part of electric service, and a basic task of the system planner is to find the most technically desirable and economically attractive method of supply. The American Electric Power System's broad principles used to plan var supply and control are described. This planning incorporates reliability, operating, and economic factors. Reliability is important and as a result many types of var sources are used, including generators, synchronous condensers, static capacitors, and shunt reactors. These source locations are widely distributed and are under local, automatic control to respond rapidly to system disturbances. There can be no compromise in the objective of maintaining a flexible and reliable transmission network capable of carrying large blocks of power from one end of the system to the other. Planning an adequate and effective var control is important in achieving this goal.

R202816X68A

Nagel, Theodore J and Vassell, Gregory S

BASIC PRINCIPLES OF PLANNING VAR CONTROL ON THE AMERICAN ELECTRIC POWER SYSTEM

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-87, No 2, pp 448-495, Feb 1968. 8 p, 9 fig, 10 ref, disc

American Electric Power Service Corp, New York, N Y

DESCRIPTORS-/ *electric power production/ transmission (electrical)/ *electric power demand/ reliability/ economics/ planning/ capacitors/ control/ electric power/ automatic control/ energy/ design criteria/ extra high voltage/ electrical networks/ electric generators/ electrical equipment

IDENTIFIERS-/ interconnected systems/ synchronous machines/ *reactive loads/ *system stability (elect)/ shunt reactors/ electric utilities

R202817X68A EXCITATION UNDER ABNORMAL CONDITIONS

Modern generator excitation systems provide good voltage regulation at normal system frequency and assist in maintaining transient stability during disturbances. However, a number of abnormal system operating conditions should be considered in evaluating excitation system performance. Some of these conditions are extended periods of operation at other than normal frequency or voltage, or both simultaneously. These system conditions can cause excessive output from the generator excitation system and impose overloads on generator and power transformer. Excitation system protection schemes are available to recognize excessive excitation and, after a suitable time delay, take corrective action returning operation to safe limits. Details of the circuitry and operation for 5 excitation protection schemes are described.

R202817X68A

Bobo, Powell O; Skooglund, John W; Wagner, Charles L

PERFORMANCE OF EXCITATION SYSTEMS UNDER ABNORMAL CONDITIONS

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-87, No 2, pp 547-553, Feb 1968. 7 p, 8 fig, 1 tab, 1 ref, append, disc

Westinghouse Electric Corp, East Pittsburgh, Pa

DESCRIPTORS-/ *excitation/ electric generators/ overloads/ frequency/ *voltage regulators/ electrical stability/ *power system operations/ electric relays/ power transformers/ solid state physics/ electrical equipment/ semiconductors/ electrical properties/ electric currents/ control
IDENTIFIERS-/ overvoltage/ performance/ power system stability/ relay systems/ *magnetic amplifiers/ protection (electrical)

R202818X68A TESTING EHV STATION INSULATOR PERFORMANCE

Two phases of wet testing ehv station insulators are described; one for conventional rainfall tests with prescribed rate of precipitation and water resistivity and the other for artificial contamination or pollution tests under wet conditions. A change in USA Standards for rate of precipitation and resistivity of water is recommended, and test data confirm the effectiveness of this new proposal to distinguish between satisfactory and unsatisfactory insulator design. The proposed contamination test procedure is convenient to use, gives reproducible results, and is sufficiently flexible for use in varying the severity of applied artificial contaminant according to user requirements. The artificial contamination, or pollution test may be used in rating insulator designs for performance under contaminated and wet conditions. Test procedures are given and test results are tabulated.

R202818X68A

Phelps, James D M; Owens, James B; Foti, Arem

TESTING EHV STATION INSULATION FOR PERFORMANCE IN CONTAMINATED CONDITIONS

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-87, No 2, pp 448-454, Feb 1968. 7 p, 2 fig, 7 tab, 6 ref, disc

American Electric Power Service Corp, Canton, Ohio; I-T-E Circuit Breaker Co, Greensburg, Pa

DESCRIPTORS-/ extra high voltage/ test facilities/ test procedures/ wet condition/ fogs/ electrical coronas/ electrical engineering/ electric potential/ *contamination/ electrical conductance/ *electric insulation/ transmission (electrical)/ rainfall/ faults (electrical)

IDENTIFIERS-/ *electrical insulators/ electrical insulation tests/ test results/ *flashover/ leakage current/ testing equipment

R202819X68A SAFETY IN LIVE LINE MAINTENANCE
Live line maintenance often receives little consideration in design of new lines. Establishment of minimum safety clearances will contribute to inclusion of maintenance requirements in line design. In the absence of standards governing insulation levels and clearances for live line maintenance practices, recommendations for minimum requirements are based on the following: (1) Recommendations are intended to establish safety minimums and are not a working guide. Additional clearances or higher safety factors are the prerogative of the user. (2) Minimum safe clearances and acceptance tests for new or reconditioned equipment intended for use in live line maintenance are premised on switching surges that reasonably can be expected to occur while live line maintenance is in progress. Presumably such work will not be performed when a lightning flashover at the immediate worksite is anticipated. (3) Particular attention has been directed to flexibility in order that future practices may not be impeded by outmoded rules. Proposed acceptance specifications and certification tests for insulated aerial lift equipment are tabulated.

R202819X68A

IEEE Committee

RECOMMENDATIONS FOR SAFETY IN LIVE LINE MAINTENANCE

Inst Elec Electron Engs Trans Power App Syst, Vol PAS-87, No 2, pp 346-352, Feb 1968. 7 p, 3 fig, 4 tab, 3 ref, disc

DESCRIPTORS--/ *safety/ *transmission lines/ standards/ dry condition/ *maintenance/ clearances/ electric insulation/ maintenance personnel/ maintenance equipment/ electric potential/ electrodes/ safety factors/ extra high voltage/ electrical coronas/ *power O&M/ hazards/ wet condition/ electric currents
IDENTIFIERS-- / *live line maintenance/ flashover/ electrical design/ electrical insulators/ switching surges/ leakage current

R202825X68A STATIC RELAYS FOR DISTANCE PROTECTION
Ease of designing transistor comparators for distance relays to be used for high-speed operation must be tempered with consideration of overall performance and integrity of operation. Operating speed must be defined over the working range of the relay, and neither speed nor measuring accuracy should be affected by severe transients generated by modern ehv networks. The transistor comparator affords great freedom of design for specific laws of operation and characteristics, as no counterpart exists in the electromechanical relay where basic characteristics are limited by behavior of the element itself. Design principles of transistor distance relays are discussed at length. Static and dynamic performance curves are given for a prototype relay tested in the laboratory and under field service conditions. Close agreement exists between specified performance and field test data. Results justify confidence in the laboratory tests performed.

R202825X68A

Jackson, L; Patrickson, J B; Wedepohl, L M

DISTANCE PROTECTION: OPTIMUM DYNAMIC DESIGN OF STATIC RELAY COMPARATORS

Proc Inst Elec Engs (Engl), Vol 115, No 2, pp 280-287, Feb 1968. 8 p, 17 fig, 11 ref, append

A Reyrolle & Co, Ltd, Hebburn; University of Manchester, Great Britain

DESCRIPTORS--/ *electric relays/ *transistors/ electrical conductance/ *electronic equipment/ electronics/ field tests/ laboratory tests/ extra high voltage/ characteristics/ electromagnetic properties/ sensitivity/ performance tests/ electrical engineering/ electrical stability

IDENTIFIERS--/ *electrical design/ response time/ Great Britain/ accuracy/ foreign research

R202800X67A ROCK FOUNDATION DEFORMABILITY

The main index of rock deformability used in design of concrete dams is the modulus of total deformation. This modulus is determined by laborious and expensive static plate loading tests at the site. These values characterize deformation properties of rock in a very limited volume of the mass, equivalent to a geometric point in the foundation at a large dam, and have a probable error of 20 to 30%. Therefore, other methods are necessary to estimate the deformability of rock foundations. Such methods include geophysical prospecting, geological studies, quantitative evaluation of jointing, and experimental model investigations. Used separately, these methods do not give satisfactory results, but in combination often reveal distinct correlations. Correlations between the modulus of total deformation and modulus of elasticity from static tests on rock specimens, dynamic modulus of elasticity, density, coefficient of joint voids, seepage, and seismic longitudinal wave velocity are discussed. The geologic structure can be evaluated only by utilizing complex correlations between different rock properties and interpretation of data superimposed on a geostructural model of a rock

R202800X67A

Gureev, A M

DEFORMABILITY OF ROCK FOUNDATIONS OF DAMS

Hydrotech Constr, No 2, pp 180-185, Feb 1967. 6 p, 10 fig, 6 ref

DESCRIPTORS-/ *dam foundations/ damsites/ concrete dams/ abutments/ *deformation/ foundation investigations/ foundation bearing tests/ foreign design practices/ elasticity modulus/ seepage/ seismic waves/ seismic investigations/ boreholes/ static tests/ *rock mechanics/ *rock foundations/ *engineering geology/ geologic investigations
IDENTIFIERS-/ USSR/ *rock properties/ joint systems/ structural geology/ rock joints/ plate load tests/ correlation/ foreign testing

R202801X66A STABILITY OF BASES OF ANCHOR FOUNDATIONS

Experiments were performed under field conditions on foundation models containing buried slab anchors with diameters of 40, 60, 80, 100, and 120 cm, about 1/2 to 1/3 the size of prototype foundation anchors for electrical transmission lines. Vertical and inclined foundation models were investigated. Test conditions and the pullout apparatus are described. Purpose of the investigation was to determine: (1) bearing capacity of bases of anchor foundations as a function of slab diameter and (2) size and shape of zones of propagation of elastic and plastic deformations, including deformation of the horizontal surface of the earth. Typical test results are given and the influence of various factors discussed. Bearing capacity of bases is strongly affected by the forces of friction and cohesion of the soil as well as the soil density.

R202801X66A

Kananyan, A S

EXPERIMENTAL INVESTIGATION OF THE STABILITY OF BASES OF ANCHOR FOUNDATIONS

Soil Mech Found Eng, No 7, pp 387-392, Nov-Dec 1966. 6 p, 5 fig, 6 tab

DESCRIPTORS-/ *anchors/ model tests/ *foundations/ foundation bearing tests/ foundation investigations/ transmission towers/ apparatus/ slabs/ internal friction/ cohesion/ deformation/ plastic deformation/ elastic deformation/ bearing capacities/ cracks/ friction/ shear forces/ footings
IDENTIFIERS-/ *pull-out tests/ foreign research/ USSR/ soil density/ failure surfaces/ anchor plates

R202802X66A STRESSES IN SOILS UNDER FOUNDATIONS

An investigation was made of types of gages used to measure soil pressures under foundations. Gages were located at the contact surface between the soil and foundation and buried in the soil at varying distances from the contact surface. A schematic of 1 type of gage is given. The contact gages were embedded in 2 reinforced concrete blocks, one a rigid strip and the other a plate. The foundation soil was a recompacted fine-grained sand. Location of the gages relative to the contact surface indicated differences in contact pressures. The buried gages showed substantially larger stress values at the edges of the foundation than the contact gages. For proper response to contact pressure, gages should be set flush with the base of the foundation or other construction where the contact pressure is desired. Sensitivity and stability of soil gages with electroacoustical measuring systems are higher than gages with wire converters.

R202802X66A

Lazebnik, G E; Smirnov, A A; Simakov, V I; et al

MEASURING STRESSES IN SOILS UNDER FOUNDATIONS

Soil Mech Found Eng, No 5, pp 322-326, Sept-Oct 1966. 5 p, 4 fig, 6 ref

DESCRIPTORS--/ *soil pressures/ *foundations/ stress distribution/ soil mechanics/ stress-strain curves/ measuring instruments/ instrumentation/ soils/ gages/ dynamometers/ strain gages/ *pressure gages/ *pressure measuring equip/ footings

IDENTIFIERS--/ embedded instruments/ foreign research/ USSR

R202832 68A STRUCTURES ON PILES IN LAKE DEPOSITS

Engineering experience derived from foundation investigations, design, and construction of 2 pile-supported pumping plants on soft, lean-clay lake sediments is reported. A complete discussion of the foundation problems is presented with details of several novel test methods and full-scale field observations. The project requirements necessitating siting the plants on poor foundations are outlined. With general soil characteristics known from Willard Dam investigations, the exploration program was designed to locate specific sites where soils of greatest firmness existed. Field investigations included undisturbed sampling, in-place penetration tests, pile loading tests, and vane shear tests adjacent to the test piles. Special laboratory tests were conducted to evaluate changes in soil compressibility due to pile driving and to study changes in pile bearing strength with time. Procedures for the field pile testing program are outlined, and settlements recorded during and after foundation construction are discussed. Validity and value of the foundation testing program were confirmed by settlement observations.

R202832 68A

Anon

PILE SUPPORTED STRUCTURES IN LAKE DEPOSITS

Bur Reclam Res Rep 11, 1968. 40 p, 32 fig, 9 tab

DESCRIPTORS--/ *pile foundations/ *foundation investigations/ vane shear tests/ stability analysis/ friction piles/ pumping plants/ model tests/ *settlement/ test procedures/ soil compression tests/ finegrained soils/ pile driving/ wood piles/ penetration tests/ backfills/ excavation/ clays/ soil investigations/ sediments/ silts

IDENTIFIERS--/ *pile tests/ pile-driving formulas/ Willard Pumping Plant, Utah/ Utah

GEOLOGY AND GEOPHYSICS

R202795X68A REMOTE SENSING OF SOILS AND ROCKS

Uses of various airborne sensors in engineering surveys of soils and rocks are discussed. The sensors include cameras, infrared and passive microwave mappers, radar, spectrometers, laser, radiofrequency, and induction devices. Applications include identifying and delimiting soil and rock units and locating soil and rock materials suitable for engineering purposes. The data also provide information about surface and subsurface conditions that would affect ease of excavation, slope stability, and suitability for subgrade, foundation, or fill materials. Many potentially valuable sensors are not being exploited or considered because of the cost of converting developments in sensor technology and data interpretation into routine engineering practice. Although sensor technology imposes limits, capability could be advanced by developing techniques to accurately and routinely interpret data in terms of engineering parameters. Has 45 references.

R202795X68A

Parker, Dana C

DEVELOPMENTS IN REMOTE SENSING APPLICABLE TO AIRBORNE ENGINEERING SURVEYS OF SOILS AND ROCKS

Mater Res Stand, Vol 8, No 2, pp 22-30, Feb 1968. 9 p, 45 ref, disc

University of Michigan, Ann Arbor

DESCRIPTORS-- / *sensors/ *radar/ infrared rays/ *aerial photography/ photogrammetry/ soil surveys/ *soil investigations/ rocks/ *geologic investigations/ laser/ soil classifications/ costs/ economics/ bibliographies/ photography/ engineering geology/ reconnaissance surveys

IDENTIFIERS--/ *airborne surveying/ airborne equipment/ *remote sensing/ EROS/ rock properties/ images/ infrared imagery/ photointerpretation

HYDRAULICS

R202815 67A CAVITATION IN HYDRAULIC STEEL STRUCTURES

Cavitation is the formation of hollow spaces in a fluid under the influence of a negative pressure. In hydraulic engineering the cavitation phenomenon is evidenced by damage to structures such as turbine runners or pump impellers. Civil engineers have only recently encountered cavitation problems. With higher head and higher velocity flows, cavitation damage is found in inlet structures, tunnels, pipelines, weir crests, stilling basins, weir gates, and especially in high-head gates and valves. Usually cavitation damage is associated with the steel portion of the structure. However, concrete is also subject to cavitation damage. Frequently the flow pattern is influenced by the steel portion of the structure and the cavitation takes place downstream in the concrete. A superficial observation would blame the steel structure alone, whereas the problem involves total design. The inner processes in cavitating flows and their physical relationships are discussed.

R202815 67A

Hartung, F

CAVITATION RESEARCH PROBLEMS IN HYDRAULIC STEEL STRUCTURES

Deutscher Stahlbau Verband, pp 125-140, June 1966. Transl from German, Bur of Reclam Transl 720, 29 p, 20 fig

Technical Institute, Munich, Germany

DESCRIPTORS-/ *cavitation/ hydraulic structures/ *fluid flow/ spillways/ *negative pressures/ hydraulic engineering/ high pressure gates/ design/ high pressure valves/ hydraulic gates and valves/ hydraulic turbines/ pumps/ tunnels/ intake structures/ pipelines/ bubbles/ turbulent flow/ outlet works

IDENTIFIERS-- / cavitation control/ cavitation noise/ hydraulic design/ *cavitation parameters/ foreign research/ Germany/ Bernoulli Theorem

R202820 67A PHOTOCOUNTER FOR FLUORESCENT TRACERS

An electronic photometric counter was developed and constructed by Delft Hydraulics Laboratory, Netherlands, for quantitative measurement of fluorescent tracers in sediment transport studies. Sediment transport can be derived from measured weight and volume concentrations by applying the least squares method and theoretical calculation of tracer particle dispersion. The instrumentation requirements are: (1) quick and accurate tracer-concentration determination, (2) discrimination of various grain sizes, and (3) discrimination of the origin of different tracers. As sieving can be done separately, instrumentation can be simplified by making the determination of concentration after sieving. Origin of the tracers can be determined by using different colors and making measurements for each color on a 1-channel instrument adjustable for various colors. The apparatus consists of a mechanical sample feed system, an ultraviolet light and photomultiplier optical system, and an electronic signal processing and counter system. The calibration of the instrument is discussed. Main sources of errors are sampling, poor coatings of fluorescent tracers on particles, counter efficiency, and variations in particle sizes and shapes.

R202820 67A

DeVries, M

PHOTOMETRIC COUNTER FOR FLUORESCENT TRACERS

La Houille Blance, No 7, pp 717-722, 1967. 6 p, 7 fig, 1 ref

Delft Hydraulics Laboratory, Netherlands

DESCRIPTORS-- / *tracers/ *sediment transport/ sediment sampling/ sands/ sedimentation/ *fluorescence/ particle shapes/ particle size/ particles/ grain sizes/ coatings/ ultraviolet rays/ colors/ counters/ electronic equipment/ measuring instruments/ instrumentation/ hydraulics

IDENTIFIERS-- / foreign products/ Netherlands/ fluorometers/ *photometers/ photomultipliers

R202839 67A JET FLOW PATTERNS IN STREAMS & RESERVOIRS

An experimental study of the modification of jet flow patterns by a nearby free surface is described. The tests were conducted in an 18-ft-dia, 4-ft-deep reservoir. One flow pattern, for a 1/2-in.-dia nozzle submerged 5 in. below the free surface was studied in detail. Other combinations of nozzle diameter, submergence and discharge were used to study the locus of the maximum velocity of the flow pattern as the flow moved downstream. In addition, the influence of an intake placed close to the jet was investigated. The flow patterns were found to be quite different from those for a deeply submerged jet. The maximum velocity moves upward as the flow proceeds downstream and eventually reaches the free surface. The lower part of the velocity distribution closely resembles that for a deeply submerged jet, whereas, the upper part is modified by wave action at the free surface. As a result there is increased spreading of the flow pattern at the free surface. A nearby intake was found to have negligible influence on the flow pattern. The velocities induced in the region of the jet by the intake are very low relative to those in the jet itself. The jet discharge is concentrated in a narrow conical form whereas the intake gathers fluid from all directions.

R202839 67A

Maxwell, W Hall C and Pazwash, Hormoz

BASIC STUDY OF JET FLOW PATTERNS RELATED TO STREAM AND RESERVOIR BEHAVIOR

University of Illinois Water Resources Center Rep 10, July 1967. 63 p, 29 fig, 2 plate, 5 tab, 11 ref

University of Illinois, Urbana

DESCRIPTORS-- / *diffusion/ flow/ hydraulics/ *jets/ air-water interfaces/ boundaries (surfaces)/ *flow characteristics/ *flow profiles/ *free surface/ interfaces/ *nozzles/ velocity distribution

IDENTIFIERS--

HYDRAULICS

R202853 66A ROUGHNESS COEFFICIENTS IN RIVERS
This study was concerned with the influence of ice, vegetation, and scouring on the flow rate in a channel connecting 2 reservoirs. When flow occurs in an open channel, resistance is encountered by the water as it flows downstream. This resistance is generally countered by the components of gravity forces acting on the body of the water in the direction of the motion. If the resistance is balanced by the gravity forces, a uniform flow will be developed. Therefore, under uniform conditions, the flow in a channel is dependent on the hydraulic radius (or water depth, in a wide channel), the frictional coefficient, and the channel slope. Various investigations on the relationship between water depth and the frictional coefficient have been done. However, in this study special attention was paid to the influences of the ice cover, the vegetation and scouring at the river surface on the frictional coefficient. The relationship between the river roughness coefficient and the stage of the upstream lake was investigated. A relationship of the form of an exponential function was determined. It was found that the river roughness coefficient decreases with increases in the stage of Lake Huron, though other factors also affect this relationship.

R202853 66A

Graf, Walter H

THE HYDRAULICS OF CHANNELS, CONNECTING TWO RESERVOIRS, WITH SPECIAL ATTENTION TO THE PROBLEM IN THE GREAT LAKES, TECHNICAL REPORT 9

Cornell University Water Resources Center Technical Rep 9, Nov 1967. 98 p, 164 fig, 2 chart

Cornell University, Ithaca, N Y

DESCRIPTORS-- / *fluvial hydraulics/ *roughness coefficients/ *open channel flow/ open channels/ *ice/ vegetation/ Reynolds number/ river beds/ *rivers/ river flow/ stage-discharge relations/ uniform flow/ *ice-water interfaces

IDENTIFIERS-- / ice forming/ *ice cover/ *St Clair River/ Lake Huron

HYDROLOGY

R202804X67A U S CONTRIBUTIONS TO IHD
The main contributions of the U S to the International Hydrological Decade have been in basic data compilations, glaciological studies, regional or large-basin studies, education, and research on hydrological phenomena and techniques. The U S also participated in UNESCO missions by assisting other countries to prepare IHD programs. A summary of the proposed U S program was published by the U S National Committee in 1965 and revised in 1966. This paper summarizes U S activities and contributions from April 1966 to May 1967. Basic data collection from Decade stations and hydrological bench marks is briefly reviewed. Progress in various studies on inventories and water balances is reported. Methodology improvements are given for use of mathematical models for runoff prediction and hydrological forecasting, and measurement of snowpack, snowfall, and rainfall. Cooperative studies, information exchange, and education and training are discussed. IHD-sponsored or organized conferences during the period between the 2nd and 3rd sessions of the coordinating council are listed. The different but related purposes of the IHD and the U S Water for Peace program are explained. Has 56 references.

R202804X67A

Heindl, L A

CONTRIBUTIONS OF THE UNITED STATES TO THE INTERNATIONAL HYDROLOGICAL DECADE - 1966-1967

Water Resources Bulletin, Vol 3, No 4, pp 7-23, Dec 1967. 17 p, 56 ref

National Research Council, Washington, D C

DESCRIPTORS-/ *hydrologic data/ *hydrology/ hydrologic instruments/ hydrometeorological station/ water balance/ glaciers/ watersheds/ snow surveys/ ice/ sediment transport/ droughts/ rainfall/ ground water/ surface water/ forecasting/ runoff forecasting/ digital computers/ data processing systems/ meteorology/ bibliographies
IDENTIFIERS-- / mathematical models/ *International Hydrolog Dec/ water budget

R202822 68A RAINSTORMS MADE TO ORDER

A computer controlled rainfall simulator has been developed by Ven Te Chow of the University of Illinois to produce artificial rainstorms. The simulator can develop storms of any intensity pattern, repeat them at any interval desired over all types of terrain, and measure runoff from the terrain with given conditions of absorption and other parameters, to an accuracy never before obtainable. The rainfall can be released over any part, or all, of a 40- by 40-ft artificial terrain. Types of storms are programmed and stored on computer tape so they can be started, stopped, or repeated at will. The terrain simulated can range from lush water basin areas to arid desert. Water runoff is accurately measured. Major objective of the entire study is to investigate basic laws of flow mechanics of surface water over artificial watersheds. Descriptions of the electronic simulator an operation of major components are given.

R202822 68A

Hoyt, L Arthur

RAINSTORMS MADE TO ORDER

Public Works, Vol 99, No 3, pp 95-98, Mar 1968. 4 p, 1 fig, 2 photo

Electronic Associates, Inc, West Long Branch, N J

DESCRIPTORS-/ *rainfall/ rainfall intensity/ simulation/ *artificial precipitation/ computer programming/ hydrology/ runoff/ *surface runoff/ watersheds/ *storms/ laboratory tests/ laboratory equipment

IDENTIFIERS-/ *rainfall simulators/ rainfall-runoff relation/ artificial watersheds/ hydrometeorology

R202852 67A RESERVOIR SEDIMENTS AFFECT WATER QUALITY

This project studied the influence of temperature, on (1) the rate at which the chemical characteristics of the bottom deposits undergo changes, and (2) the chemical effects of these changes on the quality of the overlying waters. The experiment was conducted in deposit-water contact columns which simulated the conditions existing in the hypolimnion of an impoundment. The data indicate that the rate of chemical change was influenced directly by temperature, and that nearly all change took place by diffusion from the deposit within the first month of contact. During this period the deposits became increasingly compacted. The rate of dissolved oxygen depletion increased with temperature and organic content of the deposit. The peak concentration of total nitrogen was reached between the 4th and 6th week, and this peaking time was not affected by temperature and the amount of organic matters in the bottom deposit. The peak concentrations of orthophosphates and polyphosphates were reached between the 2nd and 4th week and this peaking time was not affected by temperature or the amount of organic matters in the bottom deposits. Data are given on iron concentration in stagnant waters.

R202852 67A

Feng, Tsuan Hua

CHEMICAL EFFECTS OF BOTTOM DEPOSITS ON QUALITY OF IMPOUNDED WATERS

Office of Water Resources Res Rep A-011-Mass, Jan 1968. 33 p 15 fig, 8 tab

University of Massachusetts, Amherst

DESCRIPTORS-/ limnology/ sediments/ *reservoirs/ *water quality/ iron/ dissolved oxygen/ *temperature/ chemical properties/ nitrogen/ *lakes/ phosphates/ *impounded waters/ *bottom sediments/ stagnant water/ impoundments/ hypolimnion/ *eutrophication/ organic matter/ benthos

IDENTIFIERS-/ *Benthic deposits

IRRIGATION

R202808 67A HYDRAULIC AUTOMATIC CONTROLS IN CANALS

Several institutions in the USSR Central Asian republics have cooperated to develop an automated system of hydraulic controls for irrigation canals. After studying extensively foreign and domestic systems of upstream and downstream controls, they devised a mixed-control system, actuated by direct and reflected hydraulic surges in the canal. This system combines the advantages and features of both upstream and downstream hydraulic controls without some of the separate disadvantages, but requires canal bottom slopes to be less than 0.0003 and costs 9 to 22% more to build than a system with upstream control only. However, the mixed control system is easier to operate and more flexible and reliable. Excess water in the canal for any cause is wasted from reach to reach to the terminal wasteway, preventing damage from overfilling and eliminating need for wasteways in each reach. With a shortage of water this system is capable of equal distribution of water to all reaches and more equitable distribution to each turnout, preventing accidental unwatering of any reach. The system makes possible fulfillment of the water-use plan without unnecessary waste of surplus water and prevents water deficit due to improper operation of the canal system.

R202808 67A

Khamadov, I B; Eingorn, F Ia; Om, L A

SYSTEMS OF HYDRAULIC AUTOMATIC CONTROL IN IRRIGATION CANALS

Gidrotekhnika i Melioratsiia, No 3, pp 36-48, 1967. Transl from Russ, US Bur Reclam Transl 723, Jan 1968. 35 p, 6 fig, 12 ref

DESCRIPTORS-/ *irrigation canals/ irrigation practices/ hydrodynamics/ irrigation systems/ water requirements/ automation/ *automatic control/ demand (irrigation systems)/ canal design/ check structures/ turnouts/ hydraulic structures/ hydraulic systems/ water delivery/ irrigation O&M/ cost comparisons/ water measurement/ water surface profiles/ *surges
IDENTIFIERS-/ USSR/ water level/ headworks/ water distribution/ water use

MATERIALS ENGINEERING

R202806X67A PLASTIC DRAINAGE PIPE TESTS

Laboratory tests were conducted on 4-in. polyethylene drainage pipe subjected to various earth loads under different trench conditions. Conclusions were: (1) Plastic pipe fails by deflection rather than by rupture of the walls. A 5-in.-dia cradle excavated in undisturbed earth, designed to support a 160 deg section of the pipe, should provide support for loadings up to 300 lb per linear ft. Quicksand surrounding a pipe provides support equal to that of a cradle. (2) Concave curvature of the top of the semirigid plastic pipe begins at a deflection of about 20% of its diameter. Additional load can be applied; however, almost complete collapse of 4-in.-id pipe occurs after deflection to a vertical inside diameter of about 2.4 in. (3) Laboratory tests using a cradle, indicated that a deflection to 3.1 in. would be tolerable under similar field conditions. This would permit a loading not to exceed 300 lb per linear ft and permit an extra 50 to 75% safety factor. (4) To minimize load plastic pipe should be placed in a narrow trench approximately 10 in. wide. To provide lateral support for the semirigid pipe, a 4-1/2- or 5-in.-dia cradle should support 160 deg of the pipe circumference.

R202806X67A

Myers, V I; Rektorik, R J; Wolfe, C A Jr

DEFLECTION TESTS AND TRENCH CONDITIONS FOR PLASTIC DRAIN PIPE

Trans Amer Soc Agr Engs, Vol 10, No 4, pp 454-457, 1967. 4 p, 9 fig, 12 ref, disc

U S Department of Agriculture, Weslaco, Tex

DESCRIPTORS-/ *pipes/ *plastic tubing/ *plastics/ *deflection/ loads/ polyethylenes/ *trenches/ laboratory tests/ bedding materials/ pressure measuring equip/ strain gages/ slots/ drain tiles/ drainage

IDENTIFIERS-/ *plastic pipes/ Marston formula/ perforations

R202787 67A TURBINES FOR KRASNOIARSK POWERPLANT
Construction details of the world's most powerful vertical, radial-axial (Francis) turbines are described. A comparison of turbine parameters for Bratsk and Krasnoiarsk is made. Generator design with the thrust bearing supported on the turbine headcover permits using a single short shaft between the turbine runner and the generator rotor. Water depressing equipment permits running the turbine in air when operating the hydroelectric unit as a synchronous condenser. The many problems in engineering, manufacturing, and transporting such large pieces of equipment over great distances to the powerplant site are discussed. The turbine runners with a diameter of 7500 mm, height of 4000 mm, and a weight of 235 tons metric were the most difficult pieces to be shipped the 5000-km distance from factory to powerplant.

R202787 67A

Gal'perin, M I

KRASNOIARSK POWER STATION GETS NEW HYDROTURBINES

Gidrotek Stroitel'stvo, No 8, pp 9-13, Moscow, USSR, Aug 1967. Transl from Russ, 10,367 CSO: 1830-S, 8 p, 5 ref

DESCRIPTORS-- / hydroelectric powerplants/ *Francis turbines/ *hydraulic machinery/ thrust bearings/ design/ turbine parts/ turbine runners/ mechanical equipment/ *foreign design practices/ water transportation/ manufacturing/ turbines/ spiral cases/ welded joints/ cavitation/ speed regulators/ servomechanisms/ welding/ *hydraulic turbines
IDENTIFIERS-- / Krasnoiarsk Powerplant USSR/ USSR/ *machine design/ comparative studies/ *turbine head covers/ generator shafts

R202788 67A NEW-DESIGN HYDROELECTRIC UNITS INTRODUCED
The 500-mw hydroelectric units for Krasnoiarsk Powerplant, largest of domestic or foreign installations, are described. Special features of the turbines including some problems of design are discussed. Each turbine is equipped with an electrohydraulic speed regulator for automatic operation as a single unit, when operating on a system, or when operating under group regulation. Details of generator construction are given. Generator rotors are forced-air-cooled and the stators have direct water cooling to the windings. Distilled water is supplied for cooling systems of the generator stators and mercury arc rectifiers of the ionic excitation system by 10 electric stills in the powerplant. Generator fire protection is provided by a ring-type sprinkler system, above and below each stator, supplied with water from the spiral cases. Oil storage and purification equipment is located within the powerplant building for handling lubricating and transformer oils. Details are given for station water, and compressed air systems; generator bearings; and weights for turbine and generator components.

R202788 67A

Gamus, I M

NEW-DESIGN HYDROELECTRIC UNITS INTRODUCED

Gidrotek Stroitel'stvo, No 8, pp 3-9, Moscow, USSR, Aug 1967. Transl from Russ, 10,367 CSO: 1830-S, 12 p, 3 fig, 2 ref

DESCRIPTORS-- / hydroelectric powerplants/ mechanical equipment/ cooling/ electrical equipment/ *Francis turbines/ *electric generators/ thrust bearings/ *hydraulic machinery/ fire safety/ compressed air/ *foreign design practices/ dewatering/ spiral cases/ speed regulators/ *hydraulic turbines/ servomechanisms/ excitation/ instrumentation
IDENTIFIERS-- / Krasnoiarsk Powerplant USSR/ USSR/ *machine design

R202821X68A FRANCIS TURBINES FOR MURRAY 2 POWERPLANT
A brief discussion of Australia's multipurpose Snowy Mountain Hydroelectric Project is followed by a detailed description of the 216,000 BHP turbines manufactured by Hitachi for installation at the Murray 2 Powerplant. All parts of the turbine exposed to flowing water are made of 13-chrome stainless steel because of the rigid requirement for material having a low-temperature impact value without sacrificing wear resistance or hardness. Special provisions were made for compressed air depression of tailwater to permit quick switchover to synchronous condenser operation. Draft tube liners, pressure relief discharge pipes, and pit liners were manufactured by Australian firms in accordance with Hitachi's drawings.

R202821X68A

Ito, Hideo; Ozawa, Teruo; Doi, Takao

216,000 BHP (161,000) FRANCIS TURBINES FOR MURRAY 2 POWER STATION, AUSTRALIA

Hitachi Rev, Vol 17, No 2, pp 46-51, Jan 1968. 6 p, 9 fig

Hitachi, Ltd, Tokyo, Japan

DESCRIPTORS-- / hydroelectric power/ hydroelectric powerplants/ *Francis turbines/ foreign design practices/ *hydraulic turbines/ irrigation/ multiple purpose projects/ manufacturing/ *stainless steel/ *turbine runners/ turbine parts/ turbines

IDENTIFIERS-- / Australia/ *Snowy Mtns Hydro-Elect Auth

R202826 67A CAVITATION RESISTANCE PARAMETERS
Cavitation resistance parameters for selection of alloys are briefly reviewed. Elastic-plastic strain energy, derivable from an engineering stress-strain curve, is proposed as a new parameter. The proposed parameter is shown to correlate well with observed cavitation resistance of the alloys tested. The total strain energy concept is shown to conform with experimental observations of: (1) critical wave energy or threshold velocity concept, (2) ordering of observed cavitation resistance of the alloys, (3) accelerated cavitation damage observed on some alloys in cavitation environments, and (4) varying ratio between the cavitation resistance of some alloys when exposed to different cavitation wave energies. Has 23 references.

R202826 67A

Backstrom, T E

A SUGGESTED METALLURGICAL PARAMETER IN ALLOY SELECTION FOR CAVITATION RESISTANCE

Bur Reclam Rep ChE-72, Chem Eng Br, Dec 1967. 34 p, 13 fig, 3 tab, 23 ref, disc

Bureau of Reclamation, Denver, Colo

DESCRIPTORS-- / *cavitation/ alloys/ metallurgy/ test procedures/ bubbles/ materials failures/ mechanical properties/ *metals testing/ ultrasonics/ bibliographies/ shock waves/ *materials testing/ stress-strain curves/ erosion/ metals/ stress/ elastic deformation/ elasticity modulus/ tensile strength/ plastic deformation
IDENTIFIERS--/ cavitation control/ *cavitation resistance/ *strain energy/ *cavitation parameters/ ultrasonic cavitation tests

R202831 68A FRANCIS TURBINES AT BUKHTARMINSK
The Bukhtarminsk Hydroelectric Powerplant with 8 Francis turbines and 1 diagonal turbine became operational during 1966. Six of the turbines are identical; the others are of more modern design. One turbine is provided with a dual-flow spiral case. No undesirable phenomena have been observed in this dual-flow unit during steady operation or under fluctuating loads; turbine head cover vibration and shaft wobble have not exceeded normal values. The speed rings of these turbines were made in 4 sections and butt-welded to their spiral cases at the powerplant site. Construction of the guide vanes and operating mechanism, turbine head cover, runner, shaft, guide bearings, and turbine control equipment are discussed. Runner cavitation and deterioration of cladding appeared to be the greatest problems encountered during the initial operating experience reported.

R202831 68A

Shriro, I I

FRANCIS TURBINES AT THE BUKHTARMINSKAYA HYDROELECTRIC POWER STATION

Joint Publications Res Serv Transl 44,528, Feb 28, 1968. 6 p, 3 fig, 4 ref

DESCRIPTORS-/ hydroelectric powerplants/ *Francis turbines/ cavitation/ construction/ foreign design practices/ spiral cases/ servomechanisms/ *hydraulic turbines/ bearings/ turbine runners/ turbine parts/ guide vanes/ mechanical engineering/ mechanical equipment/ hydroelectric power/ stainless steel
IDENTIFIERS-/ USSR/ Bukhtarminsk Pwrplt, USSR/ *turbine head covers/ cladding

R202805 67A MEASURING SNOW DEPTHS BY PHOTOGRAMMETRY
Reliability and usefulness of aerial photogrammetric snow surveys are discussed. Aerial photogrammetry has been used successfully to measure snow depths at several thousand points in a 100-acre study basin in southwestern Idaho. The research demonstrates that photogrammetry is a practical method for quantitatively analyzing patterns of snow accumulation and melt in large areas with varying snow distribution. Midwinter snow distribution in the study basin ranges from less than 1/2 ft to more than 20 ft within 100 ft. To compare photogrammetric depths with field measurements, 31 randomly located points were selected on a 50-ft grid. The standard deviation of a point measurement error was about 0.7 ft and appeared to be independent of snow depth. Magnitude of error can be reduced when automatic data equipment is used and field controls are more accurate. If horizontal and vertical controls are adequate and snow surfaces are read by experienced professional operators, quite shallow snow depths averaging even less than 0.5 ft can be measured with satisfactory precision. One limiting feature of the method concerns inability to estimate directly from a photogrammetric map the water content of the snow.

R202805 67A

Smith, F M; Cooper, C F; Chapman, E G

MEASURING SNOW DEPTHS BY AERIAL PHOTOGRAMMETRY

Proc Western Snow Conf, pp 66-72, Apr 18-20, 1967. 7 p, 4 fig, 2 ref

U S Department of Agriculture, Boise, Idaho; University of Michigan, Ann Arbor; Aerial Mapping Co, Boise, Idaho
DESCRIPTORS-/ *snow/ *snow surveys/ measurement/ *aerial photography/ data reduction/ *photogrammetry/ field control/ maps/ stereoscopic photography/ watersheds/ errors

IDENTIFIERS-/ snow pack/ snow cover/ snow fences/ standard deviation/ photointerpretation/ Idaho

PROJECT PLANNING

R202824 68A ECONOMIC EVALUATION OF PROJECTS

Every engineering project requires thorough studies of technical and economic feasibilities to facilitate success. This paper embodies the total principle but concentrates on the economic aspect, because of the author's conviction that history of Canadian projects demonstrates a real weakness in this area. The problem of inadequate economic evaluation is aggravated by confusion of approaches and methods in use, many appearing to be of questionable value. Use of various techniques may produce conflicting conclusions drawn from a given situation, thus emphasizing need for adopting a uniform approach to economic evaluations. The proposed standardized approach requires development of a conceptual framework with universal application. Economic evaluations must be made at each stage within the framework before proceeding to the next. A checklist for economic evaluations is given. Time and costs for economic evaluations will probably increase for worthy projects. However, these increases will be offset by savings arising from early rejection of unsound projects. Has 15 references.

R202824 68A

Magyar, William B

ECONOMIC EVALUATION OF ENGINEERING PROJECTS

Eng Econ, Vol 13, No 2, pp 67-85, Jan-Feb 1968. 19 p, 4 fig, 15 ref

Resources Engineering of Canada Ltd, Toronto

DESCRIPTORS-/ *economics/ *feasibility studies/ *project feasibility/ cost comparisons/ costs/ project planning/ projects/ flow diagrams/ finance/ optimum development plans/ preliminary investigations/ bibliographies/ benefit-cost ratios

IDENTIFIERS-/ *economic evaluation/ economic feasibility/ engineering economy/ standardization/ cost-benefit analysis/ cost analysis

OPERATION AND MAINTENANCE

R202814 67A PIPELINE REJUVENATION WITH EPOXIES

Gas piping installed in 1941 for Bellevue Naval Housing Community, Washington, D C, had corroded to such an extent that minor repairs were no longer feasible and a complete rejuvenation or abandonment of the system was necessary. A method of lining the existing pipe with glass fiber reinforced epoxy resin was tested and found successful. The relining method uses the existing pipe as a mold and forms a 1/8-in. lining bonded to the interior walls of the pipe. The epoxy lining seals existing leaks, and while the effective cross-sectional area of the pipe is reduced, flow is not proportionately reduced due to the ceramic-like surface of the epoxy lining. The pipes are lined by a 3-step procedure: (1) brushed and blown clean, (2) plunged to seal leaks, and (3) lined using a special tool. The method is very rapid and requires only a minimum number of excavations. The relined pipe is equivalent to a new gas system, is immune to later effects of internal corrosion, and was installed at Bellevue at a cost savings of 50%. Further tests on relining steam condensate return lines indicate epoxies may be an economical and highly satisfactory answer to public utility pipeline maintenance problems.

R202814 67A

Heacock, L D and Franklin, D B

EPOXY: APPLICATIONS RELATING TO PIPELINE REJUVENATION

Navy Civil Eng, pp 21-23, Sept 1967. 3 p, 9 photo, 1 tab

U S Naval Station, Washington, D C

DESCRIPTORS-/ *pipelines/ pipes/ *linings/ maintenance/ operation and maintenance/ rehabilitation/ *repairing/ *epoxies/ glass fibers/ gases/ corrosion/ *corrosion control/ protective coatings/ public utilities/ plastics/ steam

IDENTIFIERS-/ epoxy resins/ glass reinforced plastics

SANITARY ENGINEERING

R202849 67A COST OF WASTE WATER TREATMENT PLANTS

The cost associated with building and operating waste water treatment plants or individual waste water processes has always been difficult to estimate for planning purposes. This is particularly true if the cost of the process must be related to the effectiveness of the process in removing water contaminants such as biological oxygen demand, nitrogen, or phosphorus. Many cost studies are available from the literature or from government-sponsored research, but the individual engineer often has access to only a limited number of these studies. Assumptions made in these studies and the cost items included or omitted often vary with the amount of effort invested in the study or the background and interests of the person conducting the study. A great deal of information is available, however, and this report is an effort to bring together in one place most of the useful cost information now available using a consistent set of assumptions and omissions for the purpose of producing a working document useful to engineers and scientists working in the field of waste water treatment. Has 23 references.

R202849 67A

Smith, Robert

A COMPILATION OF COST INFORMATION FOR CONVENTIONAL AND ADVANCED WASTEWATER TREATMENT PLANTS AND PROCESSES

Federal Water Pollut Contr Admin Rep, Washington, DC, Dec 1967. 9 p, 32 fig, 8 tab, 23 ref

Cincinnati Water Research Laboratory, Ohio

DESCRIPTORS-/ *sewage treatment/ *waste treatment/ *costs/ *tertiary treatment/ waste disposal/ *sewage works/ engineers estimates/ capital costs/ estimating/ *waste water/ water treatment/ sewage disposal/ sewage works/ activated sludge/ trickling filters/ electrodialysis/ bibliographies

IDENTIFIERS-/ *advance waste treatment/ sewage plant equipment

SOILS ENGINEERING

R202784 67A SOIL INVESTIGATION USING PROJECTILES

A new method for remote and rapid soil investigation using high-speed, earth-penetrating projectiles is described. Since 1962 about 700 full-scale earth penetrations have been accomplished using long, slender, instrumented projectiles dropped from aircraft. The projectiles contain accelerometers and other instruments, and broadcast their decelerations during earth penetration through a long trailing antenna. Decelerations experienced by the projectile are used to estimate material properties. The entire determination is completed from the air, and the resulting profile data identify weak and strong soils, granular and cohesive soils, and layer interfaces including bedrock. Profile data are similar and nearly as applicable as the standard penetration test. Two examples that compare results obtained using the new method with the actual soil profile are given. The method is most useful for preliminary soil investigations where ground access or time are problems and can be used under water. Has 26 references.

R202784 67A

Caudle, W N; Pope, A Y; McNeill, R L; et al

THE FEASIBILITY OF RAPID SOIL INVESTIGATIONS USING HIGH-SPEED, EARTH-PENETRATING PROJECTILES

Int Symp Wave Propagation & Dynamic Properties Earth Mater, Pap, Aug 1967. 32 p, 9 fig, 26 ref

Sandia Laboratory, Albuquerque, N Mex; Woodward-Clyde-Sherard & Ass, Oakland, Calif

DESCRIPTORS-/ *soil investigations/ *soil profiles/ soil surveys/ soil physical properties/ penetration/ *penetration tests/ bedrocks/ fins/ *penetration resistance/ preliminary investigations/ accelerometers/ deceleration/ aerodynamics/ underwater foundations/ bibliographies/ *geologic investigations/ foundation investigations

IDENTIFIERS-/ projectiles/ soil engineering

R202807X67A DYNAMIC SHEARING RESISTANCE OF SOILS

Soil-shearing stress values were measured for 3 soils. Each soil was tested at 4 moisture levels and 3 density levels for each moisture. Two interchangeable ring-shear mechanisms of different diameters were mounted on the arm of a large centrifuge to obtain the shearing stress at different loading velocities. A maximum shearing-stress value and an initial yield point value were obtained and analyzed by statistical procedures. Although data collected are limited in application to similar shearing mechanisms and soil types, the fact that reliable equations could be developed indicates a definite relationship between strain rate or loading velocity and soil-shearing stress. The relationship is strongly dependent on soil type, soil moisture, soil density, and to some degree on sample size. Lack of ability to obtain better predictions when all 3 soils are used in the regression equation indicates some factors are not included and may be undefined. Perhaps new terms need to be defined when only 1 soil is considered. Data for initial yield point indicate some definite phenomenon occurs before maximum shearing stress develops. Further study may define a more realistic variable for dynamic cohesion of a soil. Has 15 references.

R202807X67A

Hanson, T L; Johnson, H P; Young, D F

DYNAMIC SHEARING RESISTANCE OF SOILS

Trans Amer Soc Agr Engs, Vol 10, No 4, pp 439-447, 1967. 6 p, 8 fig, 5 tab, 15 ref

Montana State University, Bozeman; Iowa State University, Ames

DESCRIPTORS-/ *shear resistance/ *soils/ live loads/ *shear/ *shear strength/ loading rate/ soil moisture/ soil tests/ strain measurement/ density/ statistical analysis/ cohesion/ remolded soil samples/ shear stress/ bibliographies/ dynamics/ soil mechanics/ laboratory equipment/ shear forces
IDENTIFIERS-/ dynamic loads/ regression analysis/ dynamic tests/ strain rate/ soil dynamics

R202811 67A WATER PERMEABILITY DISTRIBUTION

Two methods are recommended for resolving the problem of whether distribution of water permeability values for a given plot can be considered as normal. The first method involves determining water permeability of a plot by making a large number of replications and constructing a graph of frequencies. The second method involves the tube method. Both are discussed and differences in results are analyzed. Reasons for asymmetrical distribution are theorized. Conclusions drawn are: (1) distribution of water permeabilities differs considerably from normal distribution in the process of determining soil water permeability by means of the tube method and is characterized generally by a high positive asymmetry, (2) distribution of logarithms of water permeabilities, although closer to normal than distribution of water permeabilities, still differs reliably from normal distribution, and (3) mean water permeability should be described in ordinary soil studies by the arithmetic mean water permeability and not by the median or its geometric mean.

R202811 67A

Dmitriyev, Ye A and Manucharov, A S

ASYMMETRICAL DISTRIBUTION OF WATER PERMEABILITIES

Soviet Soil Sci, No 5, pp 620-626, May 1967. 7 p, 3 fig, 13 ref

Moscow State University Biology-Soil Institute, USSR

DESCRIPTORS-/ *permeability/ *distribution/ soil physical properties/ soils/ soil physics/ soil science/ errors/ *soil tests/ statistical analysis/ sampling

IDENTIFIERS-/ *asymmetry/ eccentricity/ skewness/ USSR/ foreign research

R202827X67A STRUCTURAL DESIGN OF PIPELINE CASING PIPE

Design and use of protective casing pipe, a pipe of larger diameter through which a carrier pipeline is threaded, is discussed. Main emphasis is on structural design of smooth steel casing pipes installed by boring beneath railroads and highways. A study was conducted on 5 experimental casings under 3 mainline railroads. Carrier pipelines were not installed to allow data to be taken inside the casing. Inspection holes cut in the casing revealed that annular spaces left by oversize cutter heads, 1 to 1-1/2 in. larger in diameter than the casing, were substantially filled and the soil was in tight contact with the pipe. Casing diameters ranged from 30 to 42 in. Static deflections of the casings were nominal, being less than 2/3 of 1% of the pipe diameter. Since flexible pipes fail by excessive deflection, a rational design procedure is to determine maximum deflection of pipe under an anticipated set of conditions. Procedures are given for designing pipes under typical highway and railroad embankments. Recommended thicknesses are 3/16 in. for pipes of 20 in. or less in diameter and 1/4 in. for pipes from 20 to 48 in. These thicknesses are based solely upon structural requirements. Additional thickness for corrosion or handling requirements must be added to these values.

R202827X67A

Spangler, Merlin G

THE STRUCTURAL DESIGN OF PIPE CASING PIPES

Amer Soc Civil Eng Nat Meeting Water Resources Eng, New York, N Y, Preprint 540, Oct 16-20, 1967. 30 p, 10 fig, 5 tab, 6 ref

Iowa State University, Ames

DESCRIPTORS-/ *structural design/ *pipes/ pipelines/ *casings/ flexible tubing/ *steel pipes/ boring machines/ deflection/ passive pressures/ lateral forces/ field tests/ design criteria/ failure (mechanics)/ elastic theory/ embankments/ pressure distribution/ highways/ railroads

IDENTIFIERS-/ *buried pipes/ pipe cover/ pipe tests/ Boussinesq equation

R202794X67A PROBABILITY CONCEPTS IN STRUCTURAL DESIGN

Empirical deterministic concepts in structural engineering lead to design of structures for loadings unlikely to occur. These designs may include factors leading to hazardous structures. Our accumulated knowledge is obscured by deterministic procedures so that rational analysis and design are nearly impossible and even may be legally inadmissible. Structural analysis and design is concerned with performance of real structures under real loadings. Using an elementary concrete beam problem as an example, deterministic concepts are shown to present false and incomplete information. Live loads, windloads, and seismic loads are random variables and probabilistic in nature. Probabilistic concepts are used in quality control and specifications for construction materials, but engineering analysis fails to show this fundamental change in description of materials properties. The engineer should have all pertinent information in usable form and in addition all the techniques for rational decision making and optimization to show uncertainty of performance or value of a given performance. As challenges in structural design increase, deterministic views of structural safety must give way to probabilistic concepts.

R202794X67A

Benjamin, Jack R

FALLACIES AND PITFALLS IN THE DETERMINISTIC APPROACH TO STRUCTURAL SAFETY

Amer Soc Civil Engs Nat Meeting Water Resources Eng, New York, N Y, Conf Preprint 531, Oct 1967. 30 p, 15 fig, 1 tab, 13 ref

Stanford University, Calif

DESCRIPTORS-/ structural analysis/ *structural design/ structural steel/ building materials/ design criteria/ *probability/ building codes/ live loads/ hazards/ safety/ quality control/ loads/ specifications/ decision making/ costs/ *optimum design/ failure (mechanics)/ seismic design/ reinforced concrete

IDENTIFIERS-/ dynamic loads/ empirical methods/ design practices

STRUCTURAL AND ARCHITECTURAL ENGINEERING

R202812X68A STRESS TRANSFER BETWEEN CONCRETE MEMBERS
Strength of flat slabs near columns was investigated by 17 tests involving combined shear and unbalanced moment loadings. Sixteen reinforced concrete slab-column specimens containing square or rectangular interior columns and one specimen with a square edge column were tested. Narrow rectangular holes were located adjacent to the columns in 8 of the specimens. Reversals of loading simulating earthquake effects were applied to 3 of the specimens. The test specimens and test procedure used during the investigation are described. Four design methods for shear strength computation are evaluated in terms of Johannes Moe's data and the data from these tests. A modification of the ACI-ASCE Committee 326 method is recommended for practical design.

R202812X68A

Hanson, Norman W and Hanson, John M

SHEAR AND MOMENT TRANSFER BETWEEN CONCRETE SLABS AND COLUMNS

J Portland Cement Ass Res Develop Lab, Vol 10, No 1, pp 2-16, Jan 1968. 15 p, 16 fig, 4 tab, 13 ref

Portland Cement Association, Chicago, Ill

DESCRIPTORS-/ *columns/ concrete testing/ concrete structures/ moments/ *shear tests/ *slabs/ flat plates/ flexural strength/ shear failures/ *structural analysis/ shear/ *reinforced concrete/ building codes/ stress analysis/ design/ eccentric loading/ cracks/ structural engineering
IDENTIFIERS-/ earthquake loads/ ultimate strength design

WATER POLLUTION

R202834 68A GRANT AWARDS BY FWPCA--1967
A listing of research grants, demonstration grants, training grants, and research fellowships awarded in 1967 by the Federal Water Pollution Control Administration as authorized in Section 5 of the Federal Water Pollution Control Act, Public Law 660, as amended. The purposes of these grants are to encourage, cooperate with, and assist appropriate agencies, institutions, and individuals in the conduct of studies and training relating to the causes, control and prevention of water pollution. This listing is divided into 5 sections: (1) summary of awards, fiscal year 1967, (2) research grants, (a) summary of grants by states, and (b) complete list of research grants, (3) demonstration grants, (a) summary of grants by states, and (b) complete list of demonstration grants, (4) training grants, (a) summary of grants by states, and (b) complete list of training grants, and (5) research fellowships, (a) summary of awards by states, and (b) complete list of research fellowships.

R202834 68A

Anon

WATER POLLUTION CONTROL RESEARCH AND TRAINING GRANTS: 1967 GRANT AWARDS

Federal Water Pollut Contr Admin Publ CWA-10, 1968. 79 p, 5 tab

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-/ research and development/ training/ *pollution abatement/ *grants/ *water pollution control/ water pollution

IDENTIFIERS-/ *fellowships

R202835 67A FEDERAL WATER POLLUTION CONTROL ACT
This publication contains the Federal Water Pollution Control Act as amended by the Federal Water Pollution Control Act amendments of 1961 - (PL87-88), the Water Quality Act of 1965 - (PL89-234), and the Clean Water Restoration Act of 1966 - (PL89-753). Appendices include: (1) Reorganization Plan No. 2 of 1966; (2) Executive Order 11288 - Prevention, Control and Abatement of Water Pollution by Federal Activities. Also included is the text of the Oil Pollution Act as amended by the Clean Water Restoration Act of 1966 - (PL89-753).

R202835 67A

Anon

FEDERAL WATER POLLUTION CONTROL ACT: OIL POLLUTION ACT

Federal Water Pollut Contr Admin Rep, 1967. 35 p, 2 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-/ *water laws/ water quality/ *water pollution/ standards/ *water pollution control/ *water quality control/ oil wastes/ water pollution effects/ *legislation

IDENTIFIERS-/ *Federal Water Poll Cont Act/ *Oil Pollution Act/ oil pollution

R202836 67A ENFORCING WATER QUALITY STANDARDS
In this presentation the author discusses, in respect to water pollution, provisions of the constitution of the United States, concurrent Federal and state jurisdiction, development of enforcement provisions, enforcement procedures where health and welfare are affected by water pollution, establishing water quality standards, enforcing water quality standards, and court test of standards.

R202836 67A

Stetina, Henry P

PROTECTING THE HEALTH AND WELFARE OF PERSONS AFFECTED BY WATER POLLUTION AND ENFORCING WATER QUALITY STANDARDS, FEDERAL JURISDICTION AND CONGRESSIONAL ACTS
Federal Water Pollut Contr Admin Rep, May 1967, 9 p

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-/ water laws/ water pollution/ *water quality/ legislation/ impaired water quality/ federal jurisdiction/ state jurisdiction/ standards/ *water quality act/ public health/ water pollution effects/ *pollution abatement/ water pollution control/ *water quality control/ legal aspects
IDENTIFIERS-/ *water quality standards/ enforcement/ Federal Water Poll Cont Act/ Oil Pollution Act

R202837 67A METHANE-OXIDIZING BACTERIA
The basic objective of this study was to determine if methane-oxidizing bacteria can oxidize various aromatic waste products in sewage or natural waters. Bacteria which oxidize methane are known to oxidize other substances while they are growing on methane. Tests were conducted on a large number of these bacteria to determine whether they could oxidize benzene-based organic compounds. None of the methane-oxidizing bacteria attacked benzene rings. Bacteria which attack benzene (or aromatic) rings contain an unusual enzyme called benzene hydroxylase which is not found in methane-oxidizing bacteria.

R202837 67A

Kallio, R E

CO-OXIDATION OF ORGANIC MOLECULES BY METHANE-OXIDIZING BACTERIA GROWING AT THE EXPENSE OF METHANE

University of Illinois Water Resources Center Rep 11, July 1967. 5 p, 1 fig, 1 tab

University of Illinois, Urbana

DESCRIPTORS-- / bacteria/ methane/ benzenes/ oxidation/ *methane bacteria/ organic wastes/ aromatic compounds/ sewage treatment/ waste water/ cultures/ microorganisms/ wastes/ sewage/ biological treatment/ *biodegradation/ enzymes

IDENTIFIERS--

R202838 66A DELAWARE ESTUARY WATER QUALITY STUDY
This study covers the length of the Delaware River from Trenton, New Jersey, to Liston Point, Delaware. This 86-mi stretch of river, known as the estuary because of the influence of astronomically caused tidal motions, is encompassed by one of the most heavily populated and industrialized areas in the country. This preliminary report consists of a general review of the Delaware Estuary Comprehensive Study, together with the alternative water quality goals, costs and benefits, and control schemes that were considered. Objectives of the Comprehensive Study were: (1) determine the cause and effect relationships between pollution from any source and the deteriorated quality of the water in the estuary, (2) develop methods of water quality management including the development of techniques of forecasting the variations in water quality due to natural and manmade causes, and (3) prepare a comprehensive program for the improvement and maintenance of water quality in the estuary including the waste removals and other control devices necessary to manage the quality of water in the estuary for municipal, industrial, and agricultural water use, and for fisheries, recreation, and wildlife propagation.

R202838 66A

Anon

DELAWARE ESTUARY COMPREHENSIVE STUDY: PRELIMINARY REPORT AND FINDINGS

Federal Water Pollut Contr Admin Rep, Washington, DC, July 1966. 94 p, 46 fig, 21 tab, 2 append

Federal Water Pollution Control Administration, Philadelphia, Pa

DESCRIPTORS-- /*water quality/ water utilization/ *water pollution/ costs/ benefits/ *pollution abatement/ *Delaware River/ municipal wastes/ *water pollution control/ industrial wastes

IDENTIFIERS-- / *Delaware Estuary

R202840 66A BIOLOGICAL REFERENCES--FRESH & SALT WATER
This bibliography of selected references on water pollution control, waste treatment and water treatment, revises and updates earlier publications on various aspects of water pollution biology (Public Health Service Publications No 214 and 1053, and Technical Report No W-61-4). Most references in the previous publications have been retained in this book, and selected references from 1962 through 1965 have been added. The revisions and additions and the expansion to include the marine aspects with those of fresh water should be helpful in providing source material under one cover for those engaged in the study of pollution as related to aquatic life.

R202840 66A

Stewart, R Keith; Ingram, William Marcus; Mackenthum, Kenneth M; et al

WATER POLLUTION CONTROL, WASTE TREATMENT AND WATER TREATMENT, SELECTED BIOLOGICAL REFERENCES ON FRESH AND MARINE WATERS

Federal Water Pollut Contr Admin Publ WP-23, Washington, DC, 1966. 126 p, 4 plate

Robert A Taft Sanitary Engineering Center, Cincinnati, Ohio

DESCRIPTORS--/ *water pollution control/ *water treatment/ sea water/ *waste treatment/ aquatic life/ aquatic environment/ fresh water/ algae/ *pollution abatement/ industrial wastes/ water quality/ bibliographies/ sewage treatment/ biology/ potable water/ algal control/ nutrients

IDENTIFIERS--

R202841 67A LEATHER TANNING AND FINISHING POLLUTANTS
Engineering and economic data have been critically studies by means of a total industry approach. The relationship of the product to the alternative subsystem manufacturing processes has been reviewed. Because of the wide diversity of plants and processes, the authors have attempted to achieve a comprehensive overview of the approximate subprocesses. The authors have evaluated the total relationship of products produced, waste pollution load, economics involved, and long term environmental quality factors. The comprehensive survey of the Leather Tanning and Finishing Industry included a thorough literature search, administration and evaluation of a comprehensive industry-wide questionnaire, numerous visits and contacts with national tanning association and trade organization representatives, and visits to representative tanning plants. Has 60 references.

R202841 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO 7, LEATHER TANNING AND FINISHING

Federal Water Pollut Contr Admin Publ IWP-7, Sept 1967. 60 p, 60 ref

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ *wastes/ industries/ *industrial wastes/ water reuse/ *treatment facilities/ *waste disposal/ industrial plants/ costs/ *waste water treatment/ economics/ waste water disposal/ *waste treatment/ bibliographies/ pollution abatement/ water pollution/ *stream pollution

IDENTIFIERS--/ *leather industry/ *tannery wastes

R202842 67A INDUSTRIAL WASTE PROFILES: POLYMERS
This profile study of Standard Industrial Code (SIC) 28210 represents one segment of the total analysis of major contributors of waterborne pollution. Since prior investigations of this industrial classification and related fields have developed only broad generalizations, the objective was to develop more precise data. Thus the purposes of this profile study were (1) to identify, quantify, and qualify processes and wastes, gross waste quantities, waste reduction practices, and waste reduction cost information, (2) to summarize these various facets of the waste picture, and (3) to make projections on future product growth.

R202842 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO 10, PLASTICS MATERIALS AND RESINS

Federal Water Pollut Contr Admin Publ IWP-10, Washington, DC, Oct 1967. 90 p, 15 fig, 3 tab, 6 ref

IIT Research Institute Technology Center, Chicago, Ill

DESCRIPTORS--/ *plastics/ economics / resins/ epoxy resins/ industries/ wastes/ *industrial wastes/ water reuse/ *treatment facilities/ costs/ waste disposal/ industrial plants/ *waste water treatment/ cellulose/ *waste treatment/ waste water disposal/ water pollution/ *polymers/ waste water/ pollution abatement
IDENTIFIERS--/ vinyl resins/ phenolic resins/ polystyrene/ acrylics/ alkyd resins/ copolymers/ polyolefins/ polyesters/ urea resins

R202843 67A COMPUTER SIMULATION OF STREAM POLLUTION
A medium sized analog computer was used in the simulation of dissolved oxygen (DO) and biochemical oxygen demand (BOD) concentration profiles in a thermally polluted stream. One dimensional, steady-state mass dispersion models were used for the DO and BOD simulations. Simulation of temperature profiles were modeled in a similar fashion to those used for the DO and BOD equations. Dispersion of DO, BOD, and heat energy from a planar source were simultaneously simulated on an analog computer for a wide variety of boundary or initial conditions. Isothermal and nonisothermal dispersion modeling was extended so as to include a study of temperature profile optimality.

R202843 67A

Davidson, Burton

ANALOG COMPUTER SIMULATION OF STREAM POLLUTION DISPERSION MODELS WITH CHEMICAL REACTIONS

New Jersey Water Resources Res Inst, New Brunswick, Oct 1967. 5 p, 9 fig, 2 photo, append

Rutgers, The State University, New Brunswick, N J

DESCRIPTORS--/ dispersion/ dissolved oxygen/ biochemical oxygen demand/ analog computers/ simulation/ temperature/ *water pollution/ models/ algae/ photosynthesis/ contamination/ pollution abatement/ optimization/ thermal pollution

IDENTIFIERS--

R202844 67A INDUSTRIAL WASTE PROFILE--MOTOR INDUSTRY
This report has been prepared with the primary objective of developing a pollution profile for the Motor Vehicle and Motor Vehicle Equipment Industry. Basically this involved the development of material flow patterns together with the expected quantity of pollutants from each fundamental operation. Projected waste loads and treatment trends have been provided. The replacement values for the existing treatment facilities as well as the anticipated costs for future treatment practices have been included in terms of both capital and operating costs. Existing and projected waste loads and treatment practices have been established for that part of the Motor Vehicle Industry that can be characterized as stamping plants, body and final assembly operations only. Although these 3 operations involve less than 5% of the total Motor Vehicle Industry plant operations (93 of 1950), it involves almost 70% of the total employees (445,000 of 649,401) and accounted for approximately 23% (35 billion gallons per year of 148 billion gallons per year) of the total Motor Vehicle parts and industry water intake in 1966.

R202844 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO 2, MOTOR VEHICLES AND PARTS

Federal Water Pollut Contr Admin Publ IWP-2, Washington DC, Nov 1967. 116 p, 51 fig, 3 ref

Calgon Corporation, Pittsburgh, Pa

DESCRIPTORS--/ wastes/ *industrial wastes/ *treatment facilities/ water reuse/ waste disposal/ industrial plants/ *waste water treatment/ costs/ economics/ industries/ waste water disposal/ byproducts/ *waste treatment/ *motor vehicles/ *industrial waste treatment

IDENTIFIERS--/ automobile industry/ motor vehicle industry

R202845 67A INDUSTRIAL WASTE FROM CANNERIES
The following processes are included in initial preparation of canned and frozen fruits and vegetables: trimming, coring and pitting, cutting, peeling, inspection, and grading. These processes, plus plant cleanup from these operations, often contribute about 50% of the total plant waste water volume, a major portion of the plant biological oxygen demand, and except in isolated cases, virtually all of the suspended solids. The converted product handling processes for frozen fruits and vegetables are generally categorized as blanching, washing, cooling, final preparation and inspection, packing, and freezing. The most significant waste here is from the blanching operation. Generally, the final steps in preparing frozen fruit juices are extraction, screening, deoiling, deaeration, pasteurization and concentration, packing, and freezing. Tremendous quantities of solid residues and some liquid wastes result from this operation. On a national basis it is estimated that waste treatment costs this industry approximately 2% of value added in manufacture. This 2% includes in-plant treatment facilities and that portion of industry's taxes attributable to municipal pollution reduction, exclusive of collection system services. Has 60 references.

R202845 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO 6, CANNED AND FROZEN FRUITS AND VEGETABLES

Federal Water Pollut Contr Admin Publ IWP-6, 1967. 110 p, 2 plate, 15 tab, 60 ref, 2 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ wastes/ industries/ water reuse/ waste disposal/ vegetable crops/ industrial plants/ economics/ *industrial waste treatment/ costs/ *industrial wastes/ *treatment facilities/ *waste water treatment/ waste water disposal/ *waste treatment/ canneries/ fruit crops

IDENTIFIERS--

R202846 67A DAIRY INDUSTRY WASTES AND WASTE WATER
Industrial Waste Profile IWP-9, Dairies, is a qualitative and quantitative description of wastes and waste water generated in the dairy industry identified in SIC Code as 202 Dairy Products. The industry is examined in its important major subdivisions identified by SIC Code as follows: creamery butter, natural and processed cheese, condensed and evaporated milk, ice cream and frozen desserts, fluid milk. The Profile is prepared for the base year of 1963 which permits correlation with 1963 Census of Manufacturers data for production and water use. The waste and waste water estimates are developed from actual plant operating experience, and are correlated with manufacturing processes and are augmented with waste reduction and removal cost estimated. Projections of waste and waste water for future years are developed in detail.

R202846 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO 9, DAIRIES

Federal Water Pollut Contr Admin Publ IWP-9, Sept 1967. 166 p, 13 fig, 105 tab, 2 ref

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-- / *dairy industry/ *milk/ costs/ industries/ water reuse/ *treatment facilities/ waste disposal/ wastes/ industrial plants/ waste water disposal/ economics/ *industrial waste treatment/ *industrial wastes/ *waste water treatment/ waste treatment

IDENTIFIERS--/ *dairies

R202847 66A MARKET FOR ADVANCED WASTE TREATMENT
To assess the present status of waste water treatment, the type of treatment now in use and the amount of waste water discharged were determined for the major streams in the country. About 4% of 100-mi river basins now have full secondary treatment. A study was made to determine the percentage of municipal waste water present in surface supplies of 155 cities of populations of 25,000 or more. The maximum was 18%, and median was 3.5%. Consideration was given in this study to the possibility of logistical imbalances that might occur if advanced waste treatment were applied to nearly all waste waters. If a distillation-adsorption system were used, less than 6% of the Nation's annual fuel consumption would be used and less than 0.5% of the total power generation would be required. Activated-carbon needs would double. If electrodialysis were applied, 4% of the national power would be required. Membrane production would have to increase several thousandfold. Ultimate disposal of concentrates by injection, incineration, and pipelining would create no imbalances. Has 23 references.

Koenig, Louis R202847 66A

STUDIES RELATING TO MARKET PROJECTIONS FOR ADVANCED WASTE TREATMENT

Federal Water Pollut Contr Admin Publ WP-20-AWTR-17, Washington, DC, Dec 1966. 71 p, 8 fig, 13 tab, 23 ref, append

Federal Water Pollution Control Administration, Cincinnati, Ohio

DESCRIPTORS--/ *tertiary treatment/ water reuse/ ultimate disposal/ waste water (pollution)/ *waste water treatment/ distillation/ water quality/ adsorption/ electrodialysis/ water pollution/ municipal wastes/ *sewage disposal/ economics/ *sewage treatment/ bibliographies

IDENTIFIERS-- / waste water use

R202848 67A INDUSTRIAL WASTE PROFILE--STEEL INDUSTRY
This profile study was undertaken to provide the FWPCA with comprehensive information on the waterborne wastes of the blast furnace and steel mill industry. This industry includes establishments primarily engaged in manufacturing hot metal, pig iron, silvery pig iron, and ferroalloys from iron ore and iron and steel scrap; in converting pig iron, scrap iron, and scrap steel into steel; and in hot-rolling steel into basic shapes such as plates, sheets, strips, rods, bars, and tubing. Merchant blast furnaces and byproduct or beehive coke ovens are also included in this industry. Most of the iron and steel industry in the United States is centered in integrated facilities of large corporate enterprises; the 8 largest producers are among the 100 largest industrial corporations in this country. The comparatively small integrated producer in this industry represents a very large industrial complex. Even the smallest producer in the industry may not be considered a very small industrial operation. The estimates of waste loads, waste water volumes, treatment and production methods and costs given in this report are considered to be descriptive of the industry. Every plant has some uniqueness and these differences are important in assessing waste problems. Has 68 references.

R202848 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO I, BLAST FURNACES AND STEEL MILLS

Federal Water Pollut Contr Admin Publ IWP-1, Sept 1967. 100 p, 37 tab, 68 ref

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-/ steel/ iron/ wastes/ industries/ water reuse/ waste disposal/ industrial plants/ economics/ costs/ *industrial waste treatment/ byproducts/ *industrial wastes/ *treatment facilities/ *waste water treatment/ waste water disposal/ *waste treatment

IDENTIFIERS-/ *iron industry/ *steel industry

R202850 68A COST OF CLEAN WATER
The present study represents the initiation of what will be a continuing evaluation, aimed at estimating water pollution control costs with increasing accuracy. Although it has not been possible to arrive at a completely definitive estimate of required costs, it is believed that the present study provides not only a more comprehensive cost estimate than has previously been developed but also a sound base of information upon which to build future analyses. This estimate is expected to improve in accuracy with each yearly updating. This is a summary report (Volume I). Detailed information to support its findings is contained in 3 appendix volumes, Volumes II through IV. Volume II (Detailed Analses) contains descriptions and analyses of the various subject areas which formed the basis for the cost estimates in this summary report. Volume III (Industrial Waste Profiles) consists of 10 studies of major water-using industries which describe the costs and effectiveness of alternative methods of reducing industrial wastes. Volume IV (State and Major River Basin Municipal Tables) includes, for the 50 States and the Water Resources Council River Basins, tables showing the breakdown of estimated construction costs, sanitary sewers, and operation and maintenance costs.

R202850 68A

Anon

COST OF CLEAN WATER, VOL I: SUMMARY REPORT

Federal Water Pollut Contr Admin Rep, Jan 1968. 39 p, 10 tab, 12 ref

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-/ *costs/ economics/ financing/ water quality/ standards/ water quality control/ wastes/ waste disposal/ waste water disposal/ *treatment facilities/ sewage treatment/ municipal wastes/ industrial wastes/ construction costs/ operating costs/ maintenance costs/ capital costs/ state governments/ *water pollution
IDENTIFIERS-/ Water Quality Act, 1965

R202854 67A DEEP WELL DISPOSAL OF INDUSTRIAL WASTES
The use of deep wells for disposal of some concentrated, relatively untreatable liquid wastes has increased in recent years and it is expected that this method will be widely applied in the future as water pollution control is emphasized. This publication lists 110 industrial waste injection wells and some of their characteristics. The data listed includes: operator of well, well location, date of initiation of operation, total well depth, depth of injection horizon, geologic formations used for injection, chemical and physical character of waste, injection rate, injection pressure (well head), sources of information. Has 31 references.

R202854 67A

Warner, Don L

DEEP WELLS FOR INDUSTRIAL WASTE INJECTION IN THE UNITED STATES: SUMMARY OF DATA

Federal Water Pollut Contr Admin Publ WP-20-10, Washington, DC, Nov 1967. 45 p, 1 fig, 1 tab, 31 ref

Federal Water Pollution Control Administration, Cincinnati, Ohio

DESCRIPTORS-- / *deep wells/ *liquid wastes/ *waste disposal/ waste water disposal/ *injection wells/ ultimate disposal/ industrial wastes/ waste water/ *wells/ injection/ geologic formations/ pollution abatement/ bibliographies

IDENTIFIERS--

R202855 68A ECONOMIC IMPACT OF POLLUTION ABATEMENT
This study presents and evaluates the available data dealing with the requirements of state and local governments to achieve the desired Water Quality Standards for beneficial water uses. The study relates the requirements for sewage treatment plant construction in perspective to other competing projects confronting the affected units of government; and it appraises the major financial and legal problems which will be encountered in implementing the Water Quality Standards. Has 25 references.

R202855 68A

Anon

COST OF CLEAN WATER, THE ECONOMIC IMPACT OF THE CAPITAL OUTLAYS REQUIRED TO ATTAIN THE WASTEWATER QUALITY STANDARDS OF THE FEDERAL WATER POLLUTION CONTROL ACT
Federal Water Pollut Contr Admin Rep, Jan 1968. 227 p, 1 fig, 29 tab, 25 ref, 4 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-- / *costs/ capital costs/ pollution abatement/ standards/ *water quality/ construction costs/ economics/ waste disposal/ sewage treatment/ bibliographies/ financing/ grants/ water quality control/ Water Quality Act/ waste water disposal/ *treatment facilities/ *waste treatment/ municipal wastes/ *waste water treatment/ *economic impact
IDENTIFIERS--

R202857 67A TEXTILE MILL WASTE PRODUCTS
This industrial waste profile is divided into three major sections. The first section surveys the Wool Textile, Weaving and Finishing Industry; the second section, the Cotton Textile Finishing Industry; and the third section, the Synthetic Textile Finishing Industry. All of these industries are complex, variable, and in constant transition. For this reason, the study has emphasized the principal types of textiles produced. For the purposes of this study, it is important to differentiate between the finishing process and the textile operations preceding it. Except for the scouring of raw wool, the making of raw fiber into unfinished cloth or yarn is essentially a dry operation. The finishing operation is a large producer of liquid wastes, however, and is the segment of the industry which concerns us.

R202857 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO 4, TEXTILE MILL PRODUCTS

Federal Water Pollut Contr Admin Publ IWP-4, Sept 1967. 133 p, 5 plate, 32 tab, 2 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-/ *industrial waste treatment/ industrial plants/ waste water/ *wastes/ water pollution/ costs/ pollution abatement/ water quality/ industries/ waste disposal/ water reuse/ economics/ *textiles/ *cotton/ byproducts/ *industrial wastes/ *treatment facilities/ *waste water treatment/ waste water disposal/ *waste treatment
IDENTIFIERS-/ synthetics/ *wool/ *textile industry

R202858 67A PAPERMILL WASTE POLLUTION IN PUGET SOUND
The project conducted investigations in 4 parts of Puget Sound and was primarily concerned with the pollutional effects of wastes discharged by 7 pulp and papermills. Each of these mills discharges untreated or partially treated process wastes into estuarine waters. The objectives of the project were to determine the effects of these wastes on water quality and marine life, to delineate their interferences with legitimate water uses, and to ascertain pollution abatement needs. To accomplish these ends, the project conducted an integrated and comprehensive study program of in-plant waste surveys, waste distribution and water quality studies, biological investigations, and economic studies. The points of major waste discharge in the 4 study areas are separated by considerable distances and physical features of land and water. Thus, the pollution incident to each is a distinct and individual situation. This report considers separately each of these areas and the studies conducted therein. Has 60 references.

R202858 67A

Anon

POLLUTION EFFECTS OF PULP AND PAPER MILL WASTES IN PUGET SOUND, A REPORT ON STUDIES CONDUCTED BY THE WASHINGTON STATE ENFORCEMENT PROJECT

Federal Water Pollut Contr Admin Rep, Mar 1967. 473 p, 123 fig, 62 tab, 60 ref

Washington State Pollution Control Commission, Olympia; Federal Water Pollution Control Administration, Portland, Oreg

DESCRIPTORS-/ *water pollution/ water quality/ *saw mills/ estuaries/ *waste disposal/ pollution abatement/ *pulp wastes/ *wood wastes/ pulp and paper industry/ waste treatment/ treatment facilities/ Washington/ Pacific Northwest U S / *water pollution effects/ water quality control/ water pollution control/ marine animals/ marine fish/ *industrial wastes
IDENTIFIERS-/ marine biology/ *Puget Sound, Wash/ Port Angeles, Wash/ Billingham, Wash/ Anacortes, Wash/ Everett, Wash

R202789X68A WASTE TREATMENT EQUIPMENT

New developments in waste treatment and pollution control equipment are reviewed. Water pollution control programs and research by industry and government have stimulated improvements and innovations in treatment methods. New methods employed commercially include organic waste treatment without biological oxidation, sludge treatments that aid dewatering and disposal, recovery of useful products from sludges, package waste treatment units, improved mechanical aeration equipment, and automated monitoring and analysis of waste streams. The review contains a discussion on the destruction of organic matter by aeration, biochemical oxidation, and combustion. The removal of suspended solids and recovery of economical products are discussed. Advanced techniques being developed, such as adsorption, distillation, solvent extraction, and ion exchange are summarized. Methods for controlling thermal pollution include removal of heat and restoration of oxygen. Thermal pollution control equipment manufacturers are listed. Cost for waste treatment though uncertain will be high.

R202789X68A

Bry, T S and Dykes, D R

EQUIPMENT FOR A DIRTY JOB

Chem Week, Vol 102, No 7, pp 69-81, Feb 17, 1968. 10 p, 3 photo

Charles H Kline & Co, Inc, Fairfield, N J

DESCRIPTORS../ water pollution/ water quality/ water supply systems/ *water treatment/ waste disposal/ waste water/ sewage disposal/ sewage works/ *sewage treatment/ *sanitary engineering/ industrial waste treatment/ sludge/ sludge digestion/ reviews/ *pollution abatement/ oxidation/ sedimentation/ aeration/ digestion tanks/ instrumentation
IDENTIFIERS-- / equipment/ *waste treatment/ waste water treatment/ thermal pollution/ water pollution sources

R202823 68A COUNTY PLANS CLOSED WATER SYSTEM

Two water districts in San Diego County, California, are planning to use the principle of a closed system to furnish needed water supplies. The dry San Diego River bed will be used for a huge underground aquifer estimated to hold 100,000 acre-ft of water and a treatment plant and demineralization plant will reclaim waste water. The system will be such that water can be used over and over again until it is lost to evaporation, transpiration, and unavoidable leaks. The waste water reclamation system with a distribution system for delivering secondary quality water for irrigation purposes has been constructed. Under investigation is the plan to construct and operate facilities for collecting and storing brackish water in the riverbed aquifer and for withdrawing and demineralizing it for return to use through primary and secondary water systems. A description of the existing and proposed works is given.

R202823 68A

Anon

CALIFORNIA COUNTY PLANS A CLOSED WATER SYSTEM

Public Works, Vol 99, No 3, pp 70-72, Mar 1968. 3 p, 1 fig, 2 photo

DESCRIPTORS-- / *water supply systems/ *underground water storage/ water salvage/ *municipal water/ water reuse/ water costs/ demineralization/ aquifers/ brackish water/ waste water/ water treatment/ circulation/ distribution systems

IDENTIFIERS-- / San Diego County, Calif/ California/ Santee Co Water Dist, Calif/ Santee Recreatn Proj Calif/ water districts

R202786X67A NATIONAL FLOOD INSURANCE FUND SIMULATION
A model for simulating a national flood insurance fund is formulated. The objective is to model the fund and to specify optimal or near-optimal values of the premium rates, discount coefficients, initial capitalized value, and the reinsurance structure. The simulation model synthesizes flow traces, maps these into damages, collects premiums, indemnifies losses, collects reinsurance premiums from the insurance industry, and indemnifies that industry's excess losses. Relevant statistics describing the behavior of the fund are accumulated. The mean and variance of simulated annual flood damages for the United States agree well with results of other studies. The agreement is particularly good in view of the paucity of systematically collected flood data in urban areas. Exponential growth in variance of the fund over time was observed. Growth can be controlled by managing the fund.

R202786X67A

Schaake, John C, Jr and Fiering, Myron B

SIMULATION OF A NATIONAL FLOOD INSURANCE FUND

Water Resources Res, Vol 3, No 4, pp 913-929, 4th Quart 1967. 17 p, 4 fig, 10 tab, 6 ref

University of Florida, Gainesville; Harvard University, Cambridge, Mass

DESCRIPTORS--/ *flood/ *simulation/ models/ *flood damages/ hydrology/ urban areas/ computer programming/ digital computers/ statistics/ water management/ *insurance costs/ planning

IDENTIFIERS--/ *insurance/ *flood plain insurance/ stochastic models/ MUSH (Acronym)/ FISP (Acronym)

R202803X67A CALIFORNIA WATER LAW
The legal definition of a water right is given and the origin, description, and interrelationship of various types of surface and underground water rights are discussed. Riparian rights, appropriative rights, overlying rights, pueblo rights, prescriptive rights, and rights to spring water and return flows are explained as recognized in California. The objectives and physical criteria used by the State Water Rights Board for the administration of water appropriation laws are reviewed. Procedures for appropriating water and administrative procedures for determining rights are outlined. Watermaster service has proven to be an effective way to achieve water distribution in accordance with defined priority of rights. As a fair determination of rights cannot be made without some knowledge of prior use, a program for recording water use data has been established. Prior to the U S Supreme Court decision in Arizona vs California, Federal agencies generally relied upon state law. Following the Supreme Court decision, the Federal Government has applied the Reservation Principal, asserting that water rights on Federal reservations are set aside with the lands for reservation purposes. Observations on deficiencies of the California system are discussed.

R202803X67A

Spencer, L C; Johnson, L D; Page, J M; et al

WATER RIGHTS IN CALIFORNIA

Water Resources Bulletin, Vol 3, No 4, pp 36-46, Dec 1967. 11 p, 2 ref

California State Water Rights Board, Sacramento

DESCRIPTORS--/ *water laws/ surface water/ ground water/ water supplies/ water utilization/ water/ *riparian rights/ springs (water)/ laws/ administration/ water management/ water yield/ consumptive use (water)/ return flow/ *water rights

IDENTIFIERS--/ *California/ *appropriation doctrine/ prior appropriation/ water distribution/ pueblo water rights

R202851 68A LOCATING FLOOD PLAINS FROM SOIL MAPS

Soil maps provide a tool for rapid, low-cost delineation of river flood plains, based on the difference in morphology between soils frequently flooded and soils free of flooding. Very rare floods along the Mississippi River inundated over 99% of the soils that would be expected to flood but in addition flooded 7% of the terrace soils. Flooding predicted with soils information was compared with flooding predicted with an engineering study for small streams in a mature landscape in southwestern Wisconsin. For a 100-yr synthetic flood an agreement of plus or minus 4.5% was obtained. Comparison of flooding with soil types for a small stream in a recently glaciated landscape in southeastern Wisconsin indicated that alluvial soils flood frequently and that soils with restricted drainage and soils of fluvial origin also flood frequently. Some of the data are inconclusive owing to the lack of precise flooding information to serve as a basis of comparison. In areas where manmade works do not appreciably alter the stream regimen and where extensive flood plain areas must be delineated, it appears that accurate soil maps, properly interpreted, will give a good estimate of areas subject to flooding. Has 21 references.

R202851 68A

Cain, John M and Beatty, Marvin T

THE USE OF SOIL MAPS IN THE DELINEATION OF FLOOD PLAINS

Water Resources Res, Vol 4, No 1, pp 173-181, Feb 1968. 10 p, 5 fig, 2 tab, 21 ref

Wisconsin State University, River Falls; University of Wisconsin, Madison

DESCRIPTORS-- / *flood plains/ *geomorphology/ soil classifications/ flood/ hydrologic data/ topography/ alluvial deposits/ bibliographies/ fluvial morphology/ drainage/ soils/ soil groups/ Mississippi River

IDENTIFIERS--/ *soil maps

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AGRICULTURE

R202870X68A IMPACT OF WORLD FOOD NEEDS ON U S CROPS

At present growth rates of world population and food supply, the United States may of necessity return all reserve acres to production by 1975. We will face the problem of producing each year about 30 to 40% more grain and soybeans than can be used in this country. World food production has lagged behind population growth since 1958. Increase in food production is rising in a straight-line relationship, while world population is rising more rapidly as an exponential curve. Population growth is greatest in Latin America, Africa, and Asia in the "warm band" around the earth where grain crops are less adapted. Food production in these countries cannot be expected to grow at the rate population is growing. Priority must be placed on reducing population growth rather than increasing production to meet food needs. Since 1961, world grain needs have been met by reducing grain reserves at the rate of about 10 million tons a year. The United States farm problems in the last third of this century will be (1) how to produce much more than our domestic needs without large build-up of carryover and (2) how to develop farm policies to prevent the farmer from assuming the burden of an unexpectedly large carryover.

R202870X68A

Thompson, Louis M

IMPACT OF WORLD FOOD NEEDS ON AMERICAN AGRICULTURE

J Soil Water Conserv, Vol 23, No 1, pp 3-9, Jan-Feb 1968. 7 p, 17 fig, 8 ref

Iowa State University, Ames

DESCRIPTORS-- / *foods/ *agriculture/ *crops/ cereals/ population growth/ population/ foreign countries/ planning/ land resources/ policy matters/ land utilization/ consumption/ production control/ economics/ soil management

IDENTIFIERS-- / *worldwide/ grains (crops)/ wheat/ farms

CHEMICAL ENGINEERING

R202892X68A SOIL CORROSIVITY ON CAST IRON PIPE

Standards are given for evaluating the corrosive tendencies of soils toward centrifugally cast gray or ductile iron pipes. These standards were based upon correlation of experiences with gray cast iron pipe and known soil characteristics. Field and laboratory tests for soils and interpretation of results are discussed. Tests included: (1) 3 electrical resistivity methods, (2) pH determination, (3) oxidation reduction potential, (4) moisture content, and (5) description of soil type. Recommended methods for protecting cast iron pipes from corrosion are protective coatings and cathodic means. Studies indicated the most satisfactory protective system for cast iron pipe, under all observed soil conditions, utilized 8-mil loose polyethylene tubing.

R202892X68A

Smith, W Harry

SOIL EVALUATION IN RELATION TO CAST-IRON PIPE

J Amer Water Works Ass, Vol 60, No 2, pp 221-227, Feb 1968. 7 p, 3 fig, 1 tab

Cast Iron Pipe Research Association, Chicago, Ill

DESCRIPTORS-- / corrosion/ *corrosion control/ cast iron/ soil tests/ electrical resistivity/ soil moisture/ pH/ soil classification/ plastic tubing/ standards/ reduction/ oxidation/ water pipes/ polyethylenes/ cathodic protection/ protective coatings/ water supply systems/ soils/ iron/ pipes/ *pipelines

IDENTIFIERS-- / cast iron pipe/ *underground corrosion/ soil resistivity/ gray cast iron/ ductile cast iron/ *soil corrosiveness

R202860X68A SELECTION OF LARGE DIAMETER WATER PIPE
One of the most important decisions required in designing large water pipe distribution systems is the selection of the most appropriate pipe material. The basic factors in selecting the material are: (1) suitability for required service, (2) service life, and (3) economy of installation and maintenance. Types of pipe discussed and compared are reinforced concrete steel cylinder pipe, ductile-iron pipe, and fabricated electrically welded steel pipe. The 3 basic materials covered in this discussion can be made equivalent in service life by using proper alternative specifications. The only way to determine the base cost of a project is to take alternative bids on pipe furnished and installed. The initial cost will be controlled by the following principal factors: (1) internal pressures, trench loads, and embedment requirements. (2) pipe deflection related to shell thickness, (3) field joints, length of pipe sections, and blocking, and (4) corrosion protective coatings. The best pipe material would be selected then on the basis of minimum annual amortized construction cost over the life span of the pipeline plus annual maintenance cost.

R202860X68A

Proudfit, D P

SELECTION OF MATERIALS FOR LARGE DIAMETER WATER PIPE

Amer Soc Civil Engs Preprint 606, Nat Meeting Transp Eng, San Diego, Calif, Feb 1968. 14 p, 11 ref

Black and Veatch Consulting Engineers, Kansas City, Mo

DESCRIPTORS-/ *pipes/ *pipelines/ *materials/ *concrete pipes/ *steel pipes/ iron/ deflection/ joints/ anchors/ corrosion control/ coal tar coatings/ coatings/ flexible tubing/ rigid tubing/ bedding materials/ maintenance/ installation/ cost comparisons/ water supply systems

IDENTIFIERS-/ *ductile cast iron/ Spangler formula/ embedment depth/ buried pipes

R202868X67A TRANSFORMATION OF SLOPES BY SLIDES
Recession of an abrasion bench occurring during transformation of a reservoir shore can be regarded as the result of the joint action of the following processes: (1) direct erosion of rocks in the lower part of the bench and erosion of the abrasion shoal, (2) disintegration of rocks on the exposed surface of the bench during weathering, (3) caving of rock blocks from the upper part of the bench caused by erosion of the lower part of the bench, and (4) destruction of the bench by slides. When slopes are reworked by slides the rate of destruction of shores depends largely upon the development of weathering and slide movements. A method of predicting the transformation of slopes is discussed. The effect of each of the above processes is considered in this method. Practical use is possible only after thorough study of engineering geological conditions of the slope for which the forecast of transformation is made and after determination of general patterns of formed slopes of an identical geological structure.

R202868X67A

Tikhvinskii, I O

PREDICTING THE TRANSFORMATION OF SLOPES AFFECTED BY SLIDES

Hydrotech Constr, No 4, pp 353-357, Apr 1967. 5 p, 2 fig, 10 ref

DESCRIPTORS-- / *slopes/ *landslides/ *erosion/ rocks/ abrasion/ *wave action/ geology/ waves/ reservoirs/ civil engineering/ shore protection/ *shores/ drawdown/ shoaling/ engineering geology

IDENTIFIERS-- / foreign research/ USSR/ *wave energy

R202896 68A COMPUTATION OF STRAIN IN CONCRETE

The computational procedure used to reduce data from embedded strain meters to strain in surrounding concrete is described in detail. An illustrative example shows the steps in computing strain from data provided by an arbitrarily chosen strain meter of a standard group in a Bureau of Reclamation dam. Descriptions of a Carlson strain meter and a test set used to read such meters are included. Records of the preinstallation tests of the meter used in the example are included to illustrate the uses of these data in the computations. Arithmetical computations shown in the example were made using a desk calculator. Automatic data processing (ADP) methods use essentially the same procedures. An appendix is included describing a more accurate method of distributing experimental errors that is practical only for use in ADP methods.

R202896 68A

Jones, Keith

THE COMPUTATION OF STRAIN IN CONCRETE USING STRAIN METER DATA

Bur Reclam Dams Br Rep No DD-5, Apr 1968. 48 p, 14 fig, 1 photo, 3 tab, 4 ref, append

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ *concrete dams/ instrumentation/ stress analysis/ measuring instruments/ calculations/ computation/ concrete/ computers/ *structural behavior/ temperature/ Poisson ratio/ elastic theory/ *strain/ elastic deformation/ *strain measurement/ errors

IDENTIFIERS--/ *strain meters/ autogenous shrinkage/ Carlson strain meter/ embedded instruments/ least squares method

R202875 68A ELASTICITY AND CREEP OF CONCRETE

Longtime creep studies were performed on 12 sealed portland cement concrete mixes. Results indicate that sustained compressive modulus of elasticity and creep of concrete, after any particular period of constant load, can be predicted easily from the initial modulus value at load application and fixed R-line relationships. An R-line represents graphically the relationship between initial secant modulus and sustained secant modulus of loaded concrete. The effects of many variables on R-lines are reported and discussed. Some of these are: intensity and time of load; aggregate types, sizes, and amounts; cement amounts; pozzolans and admixtures; age of concrete; moisture conditions; removal of stress; uneven stress; and temperature. Moduli relations for some epoxy resin mortars and concretes and some rock materials under sustained compressive loads are discussed. Has 21 references.

R202875 68A

Hickey, Ken B

CREEP OF CONCRETE PREDICTED FROM ELASTIC MODULUS TESTS

Bur Reclam Lab Rep C-1242, Concrete Struct Br, Jan 1968. 29 p, 11 fig, 1 photo, 7 tab, 21 ref

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ *creep/ *concrete/ *elasticity modulus/ deformation/ concrete technology/ strain/ bibliographies/ recovery/ epoxies/ concrete testing/ forecasting/ laboratory tests/ mechanical properties/ rocks/ correlation techniques

IDENTIFIERS--/ epoxy resins/ epoxy mortar/ sustained loads/ longtime tests/ concrete properties/ rock properties/ *creep tests

R202878X68A RHEOLOGY OF FRESH CONCRETE

The problem of measuring concrete workability is approached by studying stability, compactibility, and mobility of fresh concrete. Stability is characterized by bleeding and segregation tendencies. Compactibility is directly related to relative density. Mobility is shown to be a function of cement paste viscosity, cohesion of mix, and angle of internal resistance to deformation. Workability tests and test results are discussed. The main conclusions are: (1) classification of degrees of workability should not be based on the compacting factor test; (2) stability, compactibility, and mobility are all necessary to determine the suitability of any mix; (3) if a range of mixes is suitably stable, the final selection should be based upon relative compactibility and mobility requirements; (4) compactibility is completely recorded by the extended compacting factor test; (5) mobility can be characterized by the angle of internal resistance from the triaxial test, or by the Vebe test. Has 54 references.

R202878X68A

Ritchie, Alistair, G B

THE RHEOLOGY OF FRESH CONCRETE

Proc Amer Soc Civil Engs, J Constr Div, Vol 94, No CO1, pp 55-74, Jan 1968. 20 p, 10 fig, 3 tab, 54 ref

University of Strathclyde, Glasgow, Scotland

DESCRIPTORS-/ *workability/ *rheology/ concrete/ bibliographies/ compaction/ concrete control/ *concrete mixes/ concrete placing/ flow/ *concrete testing/ bleeding (concrete)/ viscosity/ *concrete technology/ density

IDENTIFIERS--/ stability/ foreign testing/ Great Britain/ *concrete properties

R202880X68A CORROSION CONTROL FOR CONCRETE

Improved practices and techniques of formulating concrete have increased corrosion resistance and reduced deterioration. However, in many environments concrete may be susceptible to chemical attack. Fundamental facts on composition of concrete and physical characteristics are discussed, and documented information on corrosion of reinforcing metal is presented. Methods of protecting concrete and reinforcing metal are given. Many thermoplastic and thermosetting materials for use as protective coatings are discussed. Ceramics and some inorganic chemicals are considered for surface treatment. The information presented is intended as an introduction and should not be used as a guide on protection of concrete structures.

R202880X68A

Castleberry, Jerry R

CORROSION PREVENTION FOR CONCRETE AND METAL REINFORCING IN THE CONSTRUCTION INDUSTRY

Mater Protect, Vol 7, No 3, pp 21-28, Mar 1968. 8 p, 1 photo, 12 ref

DESCRIPTORS--/ corrosion/ *corrosion control/ *concrete/ deterioration/ concrete technology/ *reinforced concrete/ reinforcing steel/ chlorides/ physical properties/ chemical stability/ frost action/ metals/ paints/ concrete structures/ prestressed concrete/ *protective coatings/ air entrainment/ organic compounds

IDENTIFIERS--/ corrosion resistance/ concrete linings/ concrete properties/ thermosetting plastics

R202861X68A TRANSPORTING HEAVY EQUIPMENT

Unusual problems encountered and solutions considered for transporting the extremely heavy equipment for the Grand Coulee Third Powerplant are discussed. The powerplant, ultimately to be the world's largest, is a major feature of the Bureau of Reclamation's Columbia Basin Project. Also discussed is permanent handling equipment to lift and convey the 2000-ton rotors for the 600,000-kw generators, the 500-ton turbine runners, and other unusually large and heavy equipment components within the powerplant. Railways can, by special routing and in special multiaxle cars, carry loads up to 300 tons, provided clearance requirements can be met. Oversize components will be transported on special trucks or by a combination of barges and special land equipment. An investigation was conducted by the Bureau to determine the adequacy of the bridge spanning the existing spillway to carry loads up to 350 tons. Contractors will be responsible for transporting all equipment and materiels to the construction site without damage to existing facilities.

R202861X68A

Arthur, H G

TRANSPORTING EQUIPMENT FOR GRAND COULEE THIRD POWERPLANT

Amer Soc Civil Engs Preprint 651, Nat Meeting Transp Eng, San Diego, Calif, Feb 1968. 25 p, 10 fig

Bureau of Reclamation, Dever, Colo

DESCRIPTORS--/ *transportation/ barges/ bridges/ highway bridges/ draft tubes/ railroads/ *scheduling/ powerplants/ turbines/ critical path method/ turbine parts/ generators/ gates/ programs/ penstocks/ *hoisting machinery/ construction/ *hydroelectric powerplants/ hydraulic turbines

IDENTIFIERS--/ equipment installation/ *Grand Coulee Pwrplt, Wash/ *construction equipment/ Washington/ construction methods/ cranes

R202864X68A CONSTRUCTION CONTROL BY PHOTOGRAMMETRY

Numerical photogrammetry is being used for construction survey control of a 24-mi portion of Interstate 8 in San Diego County. The project is characterized by rugged, brush-covered, rocky terrain. Numerical photogrammetry can be used to establish a density of horizontal and vertical points throughout the construction corridor of a highway project. Numerical expressions of photogrammetric measurements are given as X, Y, Z coordinates in a rectangular space coordinate system. Once a stereomodel is set in an instrument and oriented to precisely fit both horizontal and vertical photocontrol, the instrument operator has complete freedom to make machine coordinate measurements at any point in the model space. Each measurement is independent of other measurements but accuracy of all measurements is dependent on ground control. In the first test standard error in a majority of the points in the horizontal and vertical directions was 0.24 ft and 0.28 ft, respectively. These results indicate the procedure to be satisfactory. Basic steps of the method are outlined.

R202864X68A

Katibah, George P

CONSTRUCTION CONTROL BY PHOTOGRAMMETRIC METHODS

Amer Soc Civil Engs Nat Meeting Transp Eng, San Diego, Calif, Feb 19-23, 1968. 19 p, 6 fig

California Division of Highways, Sacramento

DESCRIPTORS--/ *photogrammetry/ photographic equipment/ triangulation nets/ photography/ *surveying/ highways/ measurement/ control/ cameras/ measuring instruments/ numerical method/ stereoscopic photography/ construction/ *aerial photography/ *control systems/

IDENTIFIERS--/ *construction control/ construction methods/ construction practices/ highway engineering/ coordinates

R202867X67A ROCK WORK AT CHIRKEI, USSR
The Chirkei Hydroelectric Powerplant is being built on the Sulak River in the Caucasian foothills. The main structures (236-m-high concrete arch dam, powerplant, spillway, and diversion tunnel) are situated in a 250-m-deep gorge in a platy limestone. The rock masses on both flanks are jointed and potentially unstable. During the preparatory period of the project, unstable rock masses were removed and slopes trimmed by a smooth-wall contour blasting method. The blasting and excavation procedures are described. These methods were applied to rock excavation for the dam foundation and abutments to preserve the base under dam abutments, to ensure stability of high slopes in the foundation excavation, and to protect the flanks against the formation of deep cracks and disturbances from blasting.

R202867X67A

Erakhtin, B M

ROCK WORK IN THE CONSTRUCTION OF THE CHIRKEI HYDROELECTRIC POWER STATION

Hydrotech Constr, No 4, pp 305-313, Apr 1967. 9 p, 10 fig, 1 tab

DESCRIPTORS-- / *rock excavation/ drill holes/ boreholes/ blasts/ arch dams/ explosions/ *abutments/ *dam foundations/ slopes/ construction/ foreign construction/ foreign projects/ limestones/ excavation/ concrete dams

IDENTIFIERS-- / *smooth wall blasting/ blasting/ rock slope stability/ Chirkei Hydro Proj, USSR/ USSR/ rockfalls/ rock joints/ rock breakage

R202888X66A CONSTRUCTION OF THE KARA-KUM CANAL
The Kara-Kum Canal is located in Turkmenia, the most arid territory in the Soviet Union. Climate of Turkmenia is favorable, but low rainfall and high evaporation make agricultural cultivation impossible without irrigation. In 1966 the canal was more than 800 km long and the irrigated area was about 165,000 hectares. Water intake in the canal was 200 cu m/sec in 1965. Problems in planning and constructing the canal included: (1) selecting the alinement, (2) choosing the construction method for the intake, (3) determining magnitude of losses by percolation and evaporation, (4) protecting against wind erosion in the sandy desert, and (5) selecting a construction method to use in quicksand. These problems and their solutions are discussed. Large water losses are tolerated because only 20-21% of available water is being utilized. The canal is used for transportation, carrying vessels with tonnage up to 500 tons. Experimental work shows that vegetation can be controlled by either deepening the canal to a minimum of 5.5 m or adding herbivorous fish.

R202888X66A

Gueldiev, A G

CONSTRUCTION OF THE KARA-KUM CANAL IN TURKMENISTAN

Trans Int Comm Irrig Drainage, Vol 1, pp C133-C142, 1966. 14 p, 5 fig

Kara-Kum Canal Construction, USSR

DESCRIPTORS--/ *canals/ canal seepage/ canal embankments/ construction/ *irrigation canals/ irrigation/ foreign construction/ seepage losses/ unlined canals/ navigation/ deserts/ dredging/ aquatic weeds/ fish/ weed control/ evaporation/ sedimentation/ intake structures

IDENTIFIERS-- / Karakum Canal, USSR/ USSR

R202883 68A ESTIMATING SPILLWAY DESIGN FLOOD
Procedures for fixing the spillway design flood for intermediate or large dams can be divided into 2 categories; deterministic and probabilistic. No unanimously accepted methodology is available at present for estimation of floodflows from either large or small catchment areas. Magnitude of design flood obtained by the deterministic method is frequently so large, that if it were incorporated in spillway design, the required structure would be uneconomic. The greatest challenge to the hydrologist using the probabilistic method is to determine the proper distribution function for flood variables. Regardless of the method used to predict design flood, the probability of failure exists, though slight. Application of economics illustrates the impossibility of guaranteeing the complete safety of any dam and the impracticality of making a structure strong enough to withstand all conceivable critical factors. Hence, risk cannot be completely eliminated but can be reduced to some specified acceptable level. Has 27 references.

R202883 68A

Biswas, Asit K

PHILOSOPHY OF ESTIMATING SPILLWAY DESIGN FLOOD

Eng Inst Canada Conf, Halifax, Nova Scotia, May 1968. 19 p, 2 fig, 2 tab, 27 ref

Queen's University, Kingston, Ontario, Canada

DESCRIPTORS-- / *dam failures/ *safety/ safety factors/ spillways/ codes/ *spillway design flood/ probability/ methodology/ hydraulic structures/ foreign design practices/ economics/ hydrology/ flood forecasting/ flood/ damages/ bibliographies/ design flood/ maximum probable flood/ design storm
IDENTIFIERS-- / probable maximum preciptatn

R202890X68A ESTIMATING STREAM DEPLETION BY WELLS
Effect of pumping a well on flow of a nearby stream can be calculated readily using dimensionless curves and tables. Computations can be made of: (1) rate of stream depletion at any time during pumping period or after cessation of pumping; (2) volume induced from the stream during any time, during pumping or after cessation of pumping; and (3) effects, in rate and volume of stream depletion, of any selected pattern of intermittent pumping. Sample computations illustrate the use of curves and tables. An example shows that intermittent pumping may have a pattern of stream depletion not greatly different from a pattern for steady pumping of an equal volume. Residual effects of pumping on streamflow after cessation of pumping, may be greater than effects during the pumping period. Adequate advance planning including consideration of residual effects is essential to effective administration of a stream-aquifer system.

R202890X68A

Jenkins, C T

TECHNIQUES FOR COMPUTING RATE AND VOLUME OF STREAM DEPLETION BY WELLS

Ground Water, Vol 6, No 2, pp 37-46, Mar-Apr 1968. 10 p, 5 fig, 3 tab, 10 ref, append

Geological Survey, Denver, Colo

DESCRIPTORS-- / *streamflow/ *rivers/ *wells/ *ground water/ groundwater flow/ aquifers/ drawdown/ water management/ *water measurement

IDENTIFIERS-- / *streamflow depletion/ pumping/ *withdrawal/ groundwater management/ *effect

DRAINAGE AND GROUND WATER

R202891X68A PUMPING TEST ANALYSIS
A resistance network analog was used to study the early stages of a pumping test in an unconfined aquifer. Results were compared with an alternative analysis by Boulton in 1965, and good agreement was obtained. Unlike the theoretical analysis, the analog technique is versatile and can be used to study pumping tests with nonidealized boundary conditions, e.g., partially penetrating wells can be simulated. The analog method of analysis could prove to be more realistic for studying pumping tests than standard analytical techniques. Observation well readings were poor indicators of water table elevation during the early stages of the test; a pumping test based on discharge measurements is a more suitable method for pumping test analysis.

R202891X68A

Herbert, Robin

ANALYSING PUMPING TESTS BY RESISTANCE NETWORK ANALOGUE

Ground Water, Vol 6, No 2, pp 12-18, Mar-Apr 1968. 7 p, 10 fig, 1 photo, 1 tab, 8 ref

Birmingham University, England

DESCRIPTORS--/ analysis/ *electric analogs/ networks/ aquifers/ water table/ *wells/ *ground water/ *analogs/ drawdown/ simulation/ *electrical resistivity/ observation wells

IDENTIFIERS-- / Great Britain/ *pumping tests/ water level/ water wells

ELECTRICAL ENGINEERING

R202866X68A NUCLEAR POWER IS SUDDENLY HERE
Development of nuclear power during the past 10 years is reviewed and predictions made for the future growth of nuclear plants in the United States. Electric utilities have decided that use of uranium fuel is economically competitive with fossil fuel in many heavily populated and highly industrialized areas of the U S. Concern over air pollution has been an important factor in the swing to nuclear fuel for power generation. Trends to nuclear power elsewhere in the world are reviewed. At least 25 nations will have commercial nuclear power plants by the mid-1970's. Types of reactors, their advantages and economies are discussed. Nuclear power, not only for generation of electric power, but as a source of heat for desalination plants and industrial processing plants throughout the world is examined.

R202866X68A

Shaw, Milton and Whitman, Merrill

NUCLEAR POWER: SUDDENLY HERE

Sci Technol, No 75, pp 22-34, Mar 1968. 13 p, 16 fig, 6 photo

Cincinnati Milling Machine Co, Ohio

DESCRIPTORS--/ *nuclear powerplants/ electric power/ public utilities/ economics/ atmospheric pollution/ *electric power production/ foreign countries/ thermal powerplants/ thermal power/ *nuclear energy/ costs/ safety/ quality control/ accidents/ industrial plants

IDENTIFIERS--/ *nuclear power/ *nuclear reactors/ nuclear safety/ *nuclear technology/ nuclear fuels/ fossil fuels/ uranium/ plutonium

R202893X68A POWER SYSTEM DEVELOPMENTS, 1968 TO 2030
Planning for research and development of power system equipment, has been on a short-term basis and has not taken into account overall planning for the industry. The author makes long-range predictions, to the yr 2030, to clarify the research and development picture and place needs and times in proper perspective. From a vantage point in 1968, a rational prediction can be made for electric power systems development well beyond 2000 by basing the prediction on time required for development, manufacture, installation, and useful life of equipment in service. Equipment for power systems planned for the late 1960's will not be in service for 5 to 10 yr, will have a useful life of 30 to 50 yr, and will still be in service in 2005 to 2025. Ehv 1000-kv equipment under development will be operating in power systems up to 2035, and equipment in the research stage may still be in service in 2045. Realistic planning for power system expansion, using techniques beyond the concept of ehv grids, will: (1) guide new equipment development; (2) serve to place on a rational basis selection of rights of way and generating plant sites; and (3) formulate schedules for placing underground all present overhead facilities. Has 21 references.

R202893X68A

Kusko, Alexander

A PREDICTION OF POWER SYSTEM DEVELOPMENT, 1968 TO 2030

Inst Elec Electron Eng Spectrum, Vol 5, No 4, pp 75-80, Apr 1968. 6 p, 21 ref

Alexander Kusko, Inc, Cambridge, Mass

DESCRIPTORS-/ transmission (electrical)/ electric power/ bibliographies/ *forecasting/ electric powerplants/ electrical equipment/ electric power industries/ extra high voltage/ superconductivity/ magnetohydrodynamics/ *planning/ technology/ *electric power production/ sociology/ research and development/ design/ *electric power demand
IDENTIFIERS--/ superconductors/ electric conductors/ *underground cables/ *electrical design/ service life

R202897X68A CARRIER LOSSES ON ICE-COVERED POWERLINES
Propagation of high-frequency signals along a powerline is adversely affected by deposits of ice or hoarfrost on conductors. A difficulty arises in applying conventional modal analysis to a study of effects of ice on propagation, since the lossy ice layer forms a discontinuity at its surface with the lossless air. An analytical method to eliminate this difficulty was proposed, based on the transformation of nodal-charging current networks derived for ice-covered systems of parallel conductors. The method allows conventional lossy line analysis to be applied to propagation problems on ice-covered multiconductor powerlines. An example is given of calculating powerline carrier attenuation attributable to ice contribution on a 2-pole d-c line with bundled conductors. Electrical properties of ice at high frequencies are discussed and general equations for lossy line analysis are given.

R202897X68A

Perz, Matthias C

ANALYTICAL DETERMINATION OF HIGH-FREQUENCY PROPAGATION ON ICE-COVERED POWER LINES

Inst Elec Electron Eng Trans Power App Syst, Vol PAS-87, No 3, pp 695-703, Mar 1968. 9 p, 17 fig, 13 ref, append, disc

University of British Columbia, Vancouver, Canada

DESCRIPTORS--/ *powerline carriers/ *ice/ *transmission lines/ analysis/ losses/ *attenuation/ bundled conductors/ direct currents/ capacitance/ *high frequency/ contamination/ electrical engineering/ communications/ calculations/ curves/ field tests

IDENTIFIERS-- / *electric conductors/ communication systems/ ice forming/ *ice cover

R202898X68A CONTAMINATION TESTING OF 500-KV ARRESTERS

The effects of external surface contaminants and moisture on internal sparkover of lightning arresters are of prime concern in design of extra high voltage stations. Contamination alone rarely causes arrester failure. Characteristically, failures occur shortly after addition of water or moisture to the surface of a contaminated arrester. If moisture or contaminant is unevenly distributed, causing redistribution of electrical potential, overvoltage on 1 or more sections of an ehv arrester may cause external flashover or internal sparkover and subsequent failure of the entire arrester. Design and acceptance sparkover and contamination tests performed on several different ratings of a multiunit arrester, specifically used on 500-kv systems, are described and results tabulated. Sparkover characteristics were determined for various degrees of surface contamination and several different methods of surface wetting.

R202898X68A

Gothberg, Arthur W; Koerber, Arthur R; Zanzie, Charles E

CONTAMINATION TESTING OF ARRESTERS FOR 500-KV SYSTEMS

Inst Elec Electron Eng Trans Power App Syst, Vol PAS-87, No 3, pp 703-712, Mar 1968. 10 p, 10 fig, 5 tab, 2 ref, disc

Public Service Electric and Gas Co, Newark, N J; General Electric Co, Pittsfield, Mass; Stone and Webster Engineering Corp, Boston, Mass

DESCRIPTORS-- / extra high voltage/ *contamination/ laboratory tests/ rain/ electric currents/ *test procedures/ test facilities/ impulse tests (electrical)/ electric potential/ transmission (electrical)/ performance tests/ atmospheric pollution/ electrical equipment/ standards/ *electric insulation/ alternating currents/ fogs/ lightning

IDENTIFIERS-- / *lightning arresters/ flashover/ leakage current/ switching surges/ lightning protection/ protection (electrical)/ wetting

R202899X68A POWER SYSTEMS LOAD SHEDDING POLICIES

The problem of optimum dispatching minimizes cost of production and transmission of electrical power to meet a specified demand under normal operating conditions. Using and extending the methodology of optimum dispatching to problems encountered during abnormal operating conditions are logical and desirable. A systematic approach toward minimizing curtailment of service in a power system after a severe fault is discussed. Minimizing load curtailment under a given set of emergency conditions was formulated as a problem of static optimization, subject to operational and equipment constraints; and a feasible steady-state solution was obtained for the postfault network. Starting with this solution, the optimum was approached by a gradient technique. A computational procedure was based on the Newton-Raphson technique for solving power flow equations and the Kuhn-Tucker theorem for optimizing. Analytical results were verified on a 26-node sample problem. Two typical emergency situations were considered: (1) loss of generation, and (2) loss of a tieline interconnection. The same optimizing procedure and computed dual variables can be used for computer programs involving optimum service restoration, generation reserve scheduling, and system expansion studies. Has 16 references.

R202899X68A

Hajdu, Laszlo P; Peschon, John; Tinney, William F; et al

OPTIMUM LOAD-SHEDDING POLICY FOR POWER SYSTEMS

Inst Elec Electron Eng Trans Power App Syst, Vol PAS-87, No 3, pp 784-795, Mar 1968. 12 p, 4 fig, 2 tab, 16 ref, append, disc

Stanford Research Institute, Menlo Park, Calif; Bonneville Power Administration, Portland, Oreg

DESCRIPTORS-- / electric power/ *power system operations/ electric power demand/ transmission (electrical)/ electric power failures/ *electrical stability/ faults (electrical)/ electric power production/ transmission lines/ overloads/ algorithm/ computer programming/ bibliographies

IDENTIFIERS-- / *power dispatching/ *load shedding/ interconnected systems/ *optimum loading/ *power system stability/ spinning reserve

R202901X68A RESEARCH FOR BETTER TRANSMISSION DESIGNS
The Frank B Black Research Center is being built by The Ohio Brass Co near Wadsworth, Ohio, as a new facility for research and development in the electrical industry. Laboratories will be available for study of special utility projects and for improvement of transmission and distribution materials. A controlled-atmosphere enclosure for contamination tests, and facilities for stringing conductors at representative tension on full-scale towers designed for service up to above 1000-kv ac or dc will be features of new laboratories to be dedicated later in 1968. Additional equipment is being installed for indoor and outdoor tests of transmission and distribution gear. Operating largely as independent laboratories will be facilities devoted to basic ceramic research, advanced product research, chemistry, and physics.

R202901X68A

Winters, Douglas E

BIG RESEARCH CENTER SEEKS BETTER TRANSMISSION DESIGNS

Elec World, Vol 169, No 17, pp 30-32, Apr 1968. 3 p, 1 fig, 6 photo

The Ohio Brass Co, Mansfield

DESCRIPTORS-- / *transmission (electrical)/ transmission lines/ research and development/ *test facilities/ transmission towers/ direct currents/ alternating currents/ *laboratories/ laboratory equipment/ performance tests/ *extra high voltage/ electrical equipment/ electric generators

IDENTIFIERS-- / electrical insulation tests/ electric conductors/ electrical design/ lightning arresters

R202894 68A AN APPRAISAL OF SAND DRAIN PROJECTS
The New York State Department of Transportation investigated 4 major projects to determine the effectiveness of sand drain design, construction, and performance. Sand drains were successful in 3 projects providing foundation stability and eliminating detrimental pavement settlement. The other project had serious postconstruction settlement after the road was opened. The principal findings of the investigation were: (1) the classic theory of soil consolidation predicted the behavior of sand drain treatment accurately, (2) unsatisfactory performance of 1 project was caused by using displacement methods to install the sand drains, (3) moisture content changes in samples taken before and after construction reflected observed settlement accurately, and (4) gain in shear strength was greater than the predicted increase used for design analysis. Design and construction considerations are presented as a guide to individuals and organizations involved with sand drain projects.

R202894 68A

Moore, Lyndon H and Grosert, Thomas

AN APPRAISAL OF SAND DRAIN PROJECTS

New York State Dep Transp Phys Res Rep 68-1, Feb 1968. 71 p, 37 fig, 1 tab, 12 ref, 3 append

New York State Department of Transportation, Albany

DESCRIPTORS-- / *sand drains/ *foundations/ design/ construction/ auger borings/ performance tests/ highways/ settlement/ shear tests/ pore pressures/ *drainage systems/ consolidation/ laboratory tests/ design criteria/ permeability/ finegrained soils/ piezometers/ shear strength

IDENTIFIERS-- / *drains/ drain spacing/ drain holes/ construction control

R202906 67A SATELLITE DETECTION OF NATURAL RESOURCES

Data secured by remote sensing systems in orbit around the earth may assist man in meeting his increasing requirements for nonrenewable natural resources. Satellite-borne devices have the great advantage of showing very large areas of the earth's surface at a given time and revealing large structural features such as anticlines and/or major fault systems not otherwise clearly seen. High orbital speeds enable repetitious observations of the same areas at different times of day, night, or year, with the capability of framing them in global text. Evaluation of natural resources by orbiting instruments may provide the impetus to expand our reserves. The Geological Survey is working on a program dedicated to the idea that earthquakes are predictable. Satellite surveys of the earth's fault patterns would be a part of this program. That organization is also evaluating satellite sensor exploration in the fields of geography, cartography, and hydrology.

R202906 67A

Fischer, William A

SATELLITE DETECTION OF NATURAL RESOURCES

Pract Space Appl, Vol 21, pp 399-408, 1967. 10 p, 7 ref

Geological Survey, Flagstaff, Ariz

DESCRIPTORS--/ *natural resources/ *sensors/ *satellites (artificial)/ earthquakes/ faults (geology)/ explorations/ *aerial photography/ mapping/ photogrammetry/ minerals/ petroleum/ folds/ radar/ geology/ infrared rays/ geological surveys/ space engineering

IDENTIFIERS--/ surveys (data collection)/ images/ *remote sensing/ geologic defects/ Geological Survey

R202907 67A STRESSES AT EARTHQUAKE FOCI

Study of earthquakes indicates that, in the majority of cases, the focus must be a shift by shearing of one side of a subsurface discontinuity relative to the other. The stress state in the focus and the elastic stress field of the earth are closely related to the phenomena of earthquakes. Data are presented on: (1) stresses acting on earthquake foci for 6 seismically active zones of the earth; (2) orientation of these stresses; (3) typical features of the stress state; and (4) the overall elastic stress field of the earth. In each region either the largest relative compression or largest relative tension was directed parallel to a horizontal plane; and in all regions except one, that horizontal plane was perpendicular to the strike of tectonic features. The single exception was the Mediterranean region where tectonic structure was very complex. World maps show the orientation of compressive and tensile stresses on earthquake foci. Has 23 references.

R202907 67A

Balakina, L M; Vvedenskaya, A V; Misharina, L A; et al

THE STRESS STATE IN EARTHQUAKE FOCI AND THE ELASTIC STRESS FIELD OF THE EARTH

Phys Solid Earth, No 6, pp 333-342, June 1967. 11 p, 5 fig, 2 tab, 23 ref

DESCRIPTORS--/ *earthquakes/ *seismology/ geophysics/ stress analysis/ stress distribution/ shear/ compression/ tensile stress/ geology/ bibliographies/ faults (geology)/ stress/ seismic waves

IDENTIFIERS--/ earthquake focus/ *tectonics/ earthquake theory/ USSR/ foreign research/ earthquake zones

R202908 67A RECURRENCE RATE OF EARTHQUAKES

The seismic activity map, compiled from a study of the earthquake recurrence rate for a number of areas in a region, is the quantitative indicator of seismicity of that region. Characterizing areas by their seismic activity departs from the usual map presentation of discrete spatial distribution of epicenters. Points discussed are: (1) size of elements of area for a seismic activity map of a region possibly reaching 400 sq km; (2) period of study of seismic data for these maps; and (3) freedom to consider the seismic field as statistically homogeneous in time and space. Seismicity in an area can be assessed from year to year and from place to place. Homogeneity establishes seismic activity values for satisfactorily forecasting small and medium strength earthquakes, but is less accurate for large earthquakes. The time between main earthquakes was the buildup time of stresses in the earth's crust.

R202908 67A

Gaiskii, V N

DETERMINATION OF THE RECURRENCE RATE OF EARTHQUAKES BY MEANS OF A SEISMIC ACTIVITY MAP

Phys Solid Earth, No 6, pp 343-349, June 1967. 7 p, 13 fig, 23 ref

DESCRIPTORS--/ *earthquakes/ statistical analysis/ correlation techniques/ probability/ seismology/ seismic design/ geophysics/ *forecasting/ maps/ geology/ statistics/ foreign design practices/ bibliographies

IDENTIFIERS--/ earthquake focus/ epicenters/ *earthquake zones/ earthquake engineering/ USSR

R202859X68A FLOW OF WATER IN PIPELINES

The physical and chemical characteristics of water combined with the type and quality of material on the interior of pipe are the most important factors in the overall hydraulic analyses of a waterworks transmission and distribution system. Modern day pipeline materials and linings can provide conduits which maintain good flow characteristics under normal conditions for long periods of time. The Hazen-Williams formula is satisfactory for hydraulic calculations of losses in the flow of water in pipes with proper attention to the value of the roughness coefficient within limits of accuracy of all factors involved. Pertinent details for solution of the Hazen-Williams formula for 6- to 72-in. diameter-pipe are tabulated. Graphical solutions are given indicating the losses of various flows and related velocities in sizes 6- to 48-in. diameter for various roughness coefficients. Friction losses calculated by various formulas for 12- and 24-in.-diameter pipe are compared graphically.

R202859X68A

Friend, A M

FLOW OF WATER IN PIPELINES

Amer Soc Civil Engs Preprint 598, Nat Meeting Transp Eng, San Diego, Calif, Feb 1968. 16 p, 6 fig

Ralph L Woolpert Co, Dayton, Ohio

DESCRIPTORS--/ *flow/ *fluid flow/ *pipelines/ *pipes/ *concrete pipes/ *steel pipes/ *closed conduits/ *closed conduit flow/ energy losses/ roughness coefficients/ flow resistance/ head losses/ velocity/ hydraulic gradients/ hydraulics/ friction/ Manning formula/ fluid friction/ linings
IDENTIFIERS--/ Hazen-Williams formula/ Darcy-Weisbach formula/ Scobey formula/ friction coefficient (hyd)/ friction head

R202869X67A SUBMERGED INLETS TO DEEP SLUICES
An investigation of inlets to deep rectangular sluices was conducted at the V V Kuibyshev Moscow Civil Engineering Institute. Theoretical shape of vacuum-free inlets is discussed and compared with the optimum shape of inlets as determined by hydraulic model tests. The inclination of the upstream face of the structure and the slope of the conduit bottom noticeably affect the outlines of a vacuum-free inlet. Cavitation characteristics are reported. The correct shape of an inlet to deep sluices should ensure that: (1) cavitation does not occur, (2) unfavorable transitional regimes do not arise in the sluice on changing to a pressure flow from free flow or vice versa, and pressure remains stable, and (3) inlet bellmouth dimensions and shape are small and simple.

R202869X67A

Rozanov, N P; Konakhovich, N Ya; Orlova, L N

INVESTIGATION OF SUBMERGED INLETS TO DEEP RECTANGULAR SLUICES

Hydrotech Constr, No 4, pp 340-348, Apr 1967. 8 p, 5 fig, 3 tab, 5 ref

DESCRIPTORS--/ *inlets/ *outlet works/ *submerged orifices/ *sluices/ submergence/ vacuum/ cavitation/ hydraulics/ negative pressures/ hydraulic gates and valves/ foreign design practices/ laboratory tests/ hydraulic models/ *shapes/ *rectangular conduits

IDENTIFIERS--/ bellmouths/ USSR/ foreign research

R202871X68A REVIEW OF CAVITATION RESEARCH ON VALVES
This review covers 10 yr of valve research, from 1957 to 1967. A brief discussion of each research program is presented and includes: what prompted the study, valve or valves tested, instrumentation used to detect cavitation, general test procedures and equipment, and pertinent findings. Research literature is presented chronologically and includes material on the following types of valves: needle, gate, globe, butterfly, fixed-roller gate, radial gate, cone, ball or sphere, straight flow, and disc. Critical cavitation indices are presented for 12-in. ball and 12-in. butterfly valves installed in a closed circuit system with a sudden downstream enlargement. Tests were conducted under normal operating conditions. Additional tests were conducted to determine the effect of injecting air and water at various locations on the critical cavitation index. Results demonstrated that on injecting water into the sudden enlargement below the valves did not affect cavitation. However, injecting small quantities of air into the separation zones below the valves did reduce materially the cavitation intensity and hence the critical cavitation index.

R202871X68A

Tullis, J Paul and Marschner, Bernard W

REVIEW OF CAVITATION RESEARCH ON VALVES

Proc Amer Soc Civil Engs, J Hydraulic Div, Vol 94, No HY1, pp 1-16, Jan 1968. 16 p, 5 tab, 12 ref

Colorado State University, Fort Collins

DESCRIPTORS--/ *cavitation/ hydraulics/ valves/ butterfly valves/ gate valves/ globe valves/ *hydraulic gates and valves/ instrumentation/ test procedures/ closed conduits/ pipes/ hydraulic structures/ research and development/ model tests/ needle valves/ test facilities/ sudden enlargements/ laboratory tests/ reviews/ high pressure valves
IDENTIFIERS--/ *cavitation index/ cavitation control/ cavitation noise/ *hydraulic design

R202873X68A BOUNDARY-LAYER AT CURVED CONDUIT ENTRANCE

To gain a better understanding of energy reduction in a conduit inlet shaped according to potential-flow theory, boundary-layer measurements were made in a noncirculating air duct with circular, square, and rectangular inlets. Results are compared with those obtained from a numerical solution of boundary-layer equations. The compound elliptical-shaped conduit of the U S Corps of Engineers was adopted in all 3 cases. Effect of conduit Reynolds number on growth of laminar and turbulent boundary layers in the inlet portion of the conduit was studied. Comparison showed that energy reduction is higher for a rectangular inlet and least for a circular one. This is because near zero-pressure-gradient conditions are attained sooner in a rectangular inlet as an effect of the elliptic curve of the broad faces. Graphs are given showing coefficients of energy reduction as functions of relative distance into the inlet and the Reynolds number.

R202873X68A

Rao, Palepu V

BOUNDARY-LAYER DEVELOPMENT AT CURVED CONDUIT ENTRANCES

Proc Amer Soc Civil Engs, J Hydraulic Div, Vol 94, No. HY1, pp 195-217, Jan 1968. 23 p, 18 fig, 1 tab, 10 ref, append

University of Roorkee, India

DESCRIPTORS--/ *boundary layer/ *boundaries/ conduits/ hydraulics/ pipes/ flow/ hydraulic models/ *hydraulic conduits/ hydraulic engineering/ energy/ *energy losses/ model tests/ *entrances/ numerical method/ laminar flow/ turbulent flow/ *inlets/ Reynolds number/ head losses

IDENTIFIERS--/ turbulent boundary layers

R202889X66A CHANNEL ROUGHNESS IN MOVABLE BED MATERIAL

Results of studies in field and laboratory channels on the roughness of movable and deformable beds are presented. Data for 3 different sands with average diameters 0.308 mm, 0.327 mm and 0.459 mm are given and conclusions presented. Results for channels of trapezoidal sections of 2 different bed widths are shown, along with ripple characteristics for comparison. Studies on sands with a sprinkled layer of cement are also given for evaluation of grain resistance. A compartive study of different procedures for eliminating sidewall effects (Einstein, Horton, and Pavlovski methods) shows that for fixed and rippled beds, values of bed roughness are the same for Einstein's and Horton's methods. Attempts have been made to analytically compute values of Manning's n from vertical velocity distributions. Ven Te Chow's formula yielded results comparable to experimentally obtained values of n.

R202889X66A

Pramanik, H R and Sarkar, S N

A STUDY OF ROUGHNESS OF CHANNELS IN MOVABLE BED MATERIAL

Trans Int Comm Irrig Drainage, Vol 1, pp C37-C46. 10 p, 3 fig, 1 tab, 12 ref

River Research Institute, West Dengal, Calcutta, India

DESCRIPTORS--/ open channels/ *movable bed models/ *roughness/ sands/ *roughness coefficients/ *stable channels/ *trapezoidal channels/ open channel flow/ hydraulic models/ laboratory tests/ field tests/ Manning formula/ velocity distribution/ hydraulics/ canals/ *streambeds

IDENTIFIERS-- / bed movements/ *bed roughness/ bedload movement/ India/ rippled surfaces/ bed ripples/ Pavlovski coefficient/ ripple marks

R202917X66A LATERAL DISPERSION IN POROUS MEDIA
Experiments are carried out to determine the coefficient, D, of lateral dispersion in flow through porous media, with values of R between 0.3 and 380. It is found that, when R reaches a value of about 10, there is a change in the relationship between the coefficient D and the seepage velocity. The data indicate that the variation of the flow pattern with the Reynolds number is important in the study of dispersion, even when Darcy's law is applicable. This study is part of an investigation supported by Grant WP00575 from the Bureau of State Services, Public Health Service of the US Department of Health, Education, and Welfare, now Federal Water Pollution Control Administration, US Department of the Interior.

R202917X66A

Li, Wen-Hsiung and Lai, Fu-Hsiung

EXPERIMENTS ON LATERAL DISPERSION IN POROUS MEDIA

Proc Amer Soc Civil Eng, J Hydraul Div, Vol 92, No HY6, Pap 4986, pp 141-149, Nov 1966. 9 p, 6 fig, 9 ref, append

Syracuse University, N Y

DESCRIPTORS-/ permeability/ *dispersion/ *flow/ hydraulics/ Reynolds number/ coefficients/ water filters/ filters (fluid)/ porous media/ filters/ flow characteristics/ flow measurement/ flow rates

IDENTIFIERS--/ flow patterns/ flow distribution

R202924X67A SUBCRITICAL FLOW OVER HIGHWAY EMBANKMENTS
A highway embankment, when overtopped by floodwaters, is a form of broad-crested weir. As a weir, the flood discharge over the embankment is only a function of an upstream depth for free flow conditions. Free flow exists when critical depth occurs on the roadway, usually near the crown line. If a structure or vegetation downstream from the embankment controls the stage-discharge relationship, the depth of flow at the embankment may be raised sufficiently to prevent the occurrence of critical depth on the roadway. If critical depth does not occur, then subcritical (submerged) flow exists over the embankment. A method for determining the discharge under submerged flow conditions using an upstream and a downstream flow depth is presented. The method is illustrated using data collected from model highway embankments.

R202924X67A

Skogerboe, Gaylord V and Hyatt, M Leon

SUBCRITICAL FLOW OVER HIGHWAY EMBANKMENTS

Amer Soc Civil Eng J, Vol 93, No HY6, Pap 5564, pp 65-78, Nov 1967. 14 p, 3 tab, 7 fig, 3 ref, append

Utah State University, Logan

DESCRIPTORS-/ embankments/ *highways/ hydraulics/ *subcritical flow/ *submerged weirs/ submergence/ discharge measurement/ weirs/ floods/ water measurement/ flow measurement

IDENTIFIERS-/ *submerged flow/ *broad-crested weirs/ free flow

R202872X68A STOCHASTIC ANALYSIS OF DAILY RIVER FLOWS
Optimum water resources design may be achieved using data generation techniques based on models statistically derived from historical records of a hydrologic variable. However, certain statistical techniques of time series analysis are restricted to series possessing the time-invariance property which hydrologic data might not possess. The analysis of riverflow records in light of this limitation is presented. To mathematically represent daily streamflow, a trend-free model with an oscillatory component and an autoregressive process is postulated. The oscillatory component is detected and isolated using spectral and Fourier analysis, and Markov schemes are fitted to the standardized residual series. Adequacy of the models is examined by comparison of theoretical variance with computed variance. The importance of the underlying series, the sequence generated in Monte Carlo techniques, is discussed. Has 19 references.

R202872X68A

Quimpo, Rafael G

STOCHASTIC ANALYSIS OF DAILY RIVER FLOWS

Proc Amer Soc Civil Engs, J Hydraul Div, Vol 94, No HY1, pp 43-57, Jan 1968. 15 p, 2 fig, 6 tab, 19 ref, append

University of Pittsburgh, Pa

DESCRIPTORS-/ mathematical analysis/ rivers/ *streamflow/ *streamflow forecasting/ runoff/ statistical analysis/ streamflow records/ Fourier analysis/ hydrology/ streams/ hydrographs/ *runoff forecasting/ streams/ simulation/ bibliographies/ water resources/ hydraulics/ series (mathematics)
IDENTIFIERS--/ *stochastic models/ mathematical models/ Markov model/ stochastic processes

R202874X68A UNIT GRAPHS FOR NONUNIFORM RAINFALL
Correlation between Snyder's basin constants consisting of a lag coefficient and a peak magnitude coefficient, and basin physical characteristics of drainage area, total length, average slope length to the center of area, and elongation is established using synthetic data. Actual data are used to compensate for discrepancies introduced through initial use of synthetic data. Effects of nonuniform rainfall distribution on the basin runoff hydrograph are represented by a unit graph, selected from 3 computed for each basin. Computation formulas are presented to define each of the 3 basin unit graphs. A dimensionless unit graph is introduced for a more accurate definition of the rising and falling links of each unit graph. The system presented was tested with success and is believed to be generally representative of the hydrologic response characteristic of a drainage basin.

R202874X68A

Buil, Jose A

UNIT GRAPHS FOR NONUNIFORM RAINFALL DISTRIBUTION

Proc Amer Soc Civil Engs, J Hydraulic Div, Vol 94, No HY1, pp 235-257, Jan 1968. 23 p, 13 fig, 5 tab, 9 ref, append

Corps of Engineers, Kansas City, Mo

DESCRIPTORS--/ *unit hydrographs/ drainage basins/ watersheds/ *runoff/ *rainfall/ hydrographs/ *distribution/ surface runoff/ hydrology/ flood peaks/ digital computers/ computer programming/ storms/ rainfall intensity/ runoff coefficients/ flood hydrographs/ hydrologic data/ correlation techniques
IDENTIFIERS-/ *rainfall-runoff relation/ Snyders unit graph/ rainfall disposition/ storm patterns/ storm duration/ peak discharge

R202886X68A DISSIPATIVE RIVER FLOW MODEL
Derivation and solution of a second order linear differential equation for the instantaneous unit hydrograph of a stream are presented. Derivation of the equation has 3 basic assumptions: (1) an analogy exists between current flow in an electrical circuit and hydraulic flow in a river; (2) the watershed can be divided into a series of n reaches with the same values of constants for all reaches; and (3) outflow from a reach is proportional to the difference in potential energy in the reach. The differential equation is easily solved for n equal 1, but solution becomes progressively more difficult as n increases. Some suggestions for simplifying the model are made, but evaluation of these suggestions must await further study. The writer's model appears closely related to Dooge's model, having 4 deg of freedom compared to 5 for Dooge's model, but is simpler to use since prior knowledge of watershed hydraulics is not required.

R202886X68A

Jackson, Donald R

A DISSIPATIVE RIVER FLOW MODEL

J Hydrol, Vol 6, No 1, pp 33-44, Jan 1968. 12 p, 3 fig, 7 ref, 2 append

University of Pittsburgh, Pa

DESCRIPTORS--/ *rivers/ models/ *streamflow/ hydrology/ *flow/ rainfall/ *unit hydrographs/ differential equations/ hydrologic data/ *streamflow forecasting/ flood routing/ computer programming/ streams/ runoff/ surface runoff/ hydrographs/ reaches (distance)

IDENTIFIERS-- / *instantaneous unit hydrographs/ *dissipation/ *river flow/ LaPlace equations/ mathematical models/ *hydrologic models

R202903 67A APPLICATIONS OF SPACE OBSERVATIONS
This paper is a brief summary of progress in applying data obtained by instrumented spacecraft to the environmental sciences. Data from satellites provide information that can greatly benefit all mankind. Meteorologists using data from present operational weather satellites can guarantee that no major storm can form anywhere on earth without being accurately located on the day of its birth. Satellites now under construction will make possible prediction of storm formation and motion more accurately and earlier. Sensors presently under construction will make possible mapping of ocean currents, turbidity, and temperature. Sensors measuring radiance from land surfaces will greatly simplify collecting earth surface data in sparsely populated areas. This new data source can be applied to such problems as: (1) locust control in deserts, (2) snow field mapping in mountains, and (3) ice and snow mapping over inland lakes and rivers. Data collection, now a multibillion dollar industry, is helped and challenged by the combination of data-gathering and data-transmitting earth-synchronous satellites.

R202903 67A

Oliver, Vincent J

SOME APPLICATIONS OF SPACE OBSERVATIONS TO METEOROLOGY, OCEANOGRAPHY AND HYDROLOGY

Preprint, Fourth Annu Meeting, Amer Inst Aeron Astronautics, Anaheim, Calif, Oct 1967. 10 p, 11 fig, 10 ref

National Environmental Satellite Center, Washington, DC

DESCRIPTORS--/ *aerial photography/ sensors/ *satellites (artificial)/ space engineering/ oceanography/ hydrology/ meteorology/ *snow surveys/ weather forecasting/ ocean currents/ data collection system/ mapping/ cloud cover/ ice/ storms/ radiation measurement/ environment

IDENTIFIERS-- / fishing/ water resources management/ snow cover/ ice cover/ remote sensing

R202928 67A SIMULATION OF THE RED RIVER

A mathematical model of the Red River of the North Basin, Minnesota and North Dakota, can be used as a water quality planning management tool to simulate time and spatial variations of flow and concentrations of total dissolved solids throughout the basin. Other parameters of water quality can be included in the model with little effort. The model incorporates hydrologic and water quality data and the Fiering-Pisano mathematical model described in the report "River Basin Simulation Program" issued by the Office of Comprehensive Planning and Programs, March 1967. Given (1) the River Basin Simulation Program, (2) this report, and (3) tape of operational hydrology, other investigators can study various combinations of water quality management schemes. This report describes the application of the Fiering-Pisano mathematical model to the Red River of the North Basin. The report describes pertinent hydrologic factors, waste loadings to the river system, and methods of applying the model to determine effects of water management practices in the basin. The report presents the model in a form that is applicable to other river basin systems for which appropriate data are available.

R202928 67A

Anon

FITTING THE RED RIVER OF THE NORTH BASIN TO THE GENERAL RIVER BASIN SIMULATION PROGRAM

Federal Water Pollut Contr Admin Div Tech Contr Compr Planning & Program Rep, Apr 1967. 32 p, 10 fig, 4 tab, 5 ref, append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-/ streamflow forecasting/ *river basins/ water resources/ water quality/ *simulation/ water management/ hydrologic data/ river forecasting/ hydrology/ *mathematical models/ *model studies/ dissolved solids

IDENTIFIERS-/ *Red Riv of the North Basin

R202879 68A INVESTMENT DECISION FOR SEEPAGE REDUCTION

Expenditures undertaken for the purpose of seepage control are standard examples of the investment problem under which expenditures are made at some point in time in anticipation of attaining a larger future stream of income. A general framework for making optimal planning decisions calls for the following elements; criteria for making choices, a set of alternative courses of action or policies proposed as solutions to the problem, and expected outcomes or consequences of each policy. While less than an ideal criterion, maximizing net national income is preferable to any purely physical entity as a criterion for choice. Valuing water savings should be performed by determining added cost of the least expensive alternative source of water. If no additional water is available, the value in use must be estimated. Estimating the value productivity of water is a difficult task but 2 techniques are suggested.

R202879 68A

Young, Robert A

THE INVESTMENT DECISION FOR SEEPAGE REDUCTION

Second Seepage Symp, Phoenix, Ariz, Mar 1968. 10 p, 6 ref

University of Arizona, Tucson

DESCRIPTORS-/ seepage/ *seepage losses/ cost comparisons/ costs/ water costs/ *economics/ *optimum use/ social values/ public opinion/ values/ interest (finance)/ decision making/ benefit-cost ratios/ irrigation/ irrigation practices

IDENTIFIERS-/ investment/ *water losses/ *seepage control

R202881 68A ECONOMIC COMPARISON OF IRRIGATION SYSTEMS

Comparisons of open conduit and pipe irrigation distribution systems are discussed on economic basis. To conserve water and secure other benefits, planners must consider fully lined canals or pipes for all constructed waterways for conveyance and distribution of project water supplies. When planning new projects, the Bureau of Reclamation requires full justification for plans not providing for lining canals. In areas where an excess of irrigable land is available for the water supply or where other potential uses exist for water, canal linings or pipes generally will be economically justified. Other advantages of lined canals or pipes such as reduced operation, maintenance, and replacement costs are listed. An economic analysis of unlined versus lined canals and pipe distribution systems is given. Generally the most significant tangible benefit, in addition to the value of water conserved, is reduced OM&R costs. A table of typical OM&R costs and gross crop values for states served by Reclamation projects is given.

R202881 68A

Prichard, B A

ECONOMIC COMPARISONS OF OPEN CONDUIT AND PIPE IRRIGATION DISTRIBUTION SYSTEMS

Pap Second Seepage Symp, Phoenix, Ariz, Mar 1968. 15 p, 2 tab, 4 ref

DESCRIPTORS-- / economics/ canals/ *canal linings/ open channels/ linings/ cost comparisons/ irrigation/ *distribution systems/ benefit-cost ratios/ operation and maintenance/ water pipes/ *pipelines/ planning/ pipes/ capital costs/ *irrigation systems/ irrigation O&M

IDENTIFIERS-- / *economic evaluation/ water use

R202902 68A BURIED ASPHALT MEMBRANE CANAL LININGS

Buried asphalt membrane linings provide low-cost seepage control on irrigation canal systems. A study was conducted on the aging characteristics of this lining. Of 112 field samples evaluated, over 80% demonstrated satisfactory membrane resistance to field aging, and should provide adequate seepage control for many years beyond the 14-year service age studied. A study is described on a method of reducing canal seepage by injecting an asphalt emulsion under the soil to form an impervious membrane. This application is intended for use in unlined canals with water delivery commitments that do not allow dewatering for conventional lining construction.

R202902 68A

Ellsperman, L M and Morrison, W R

ASPHALTIC MEMBRANES FOR WATER SEEPAGE CONTROL

Pap, Symp New Uses for Asphalts, Amer Chem Soc, Atlantic City, N J, Sept 1968. 43 p, 28 fig, 5 tab, 7 ref, append

Bureau of Reclamation, Denver, Colo

DESCRIPTORS-- / *lower cost canal linings/ *asphalt/ *bituminous materials/ weathering/ emulsions/ field tests/ materials testing/ membranes/ aging/ *buried membranes/ laboratory equipment/ impervious linings/ unlined canals/ *underwater construction/ injection/ *canal linings/ operation and maintenance/ *seepage/ *canal seepage
IDENTIFIERS-- / seepage control/ catalytically blown asphalt/ *underwater canal sealing/ cationic asphalt emulsions

R202877X68A ORTHOGONAL POLYNOMIALS FOR LEAST SQUARES

The technique normally used to obtain a functional relationship from parameter measurements is a least squares regression analysis. If the data are not linear, the least squares method becomes laborious because of the required solution of simultaneous equations and the accumulation of the sums of squares, cubes, and higher powers. A least squares regression method based on orthogonal polynomials greatly reduces the labor, especially for higher order polynomials. Orthogonal polynomials are used as weighing factors in summations to yield regression constants. They are not data dependent and need be computed only once for use with many groups of data. This method does not require solution of simultaneous equations, and the only sums required are those of weight-data value products. In addition to ease of computation, benefits include a simple procedure for increasing the degree of the polynomial in order to decrease fitting error, and a simple expression for the goodness of fit statistic. Tables are given to permit desk calculator determinations of high degree fitting polynomials.

R202877X68A

Brockman, W E

LEAST SQUARES--AN EASY METHOD

Instrum Contr Syst, Vol 41, No 2, pp 105-107, Feb 1968. 3 p, 2 fig, 4 tab, 1 ref

University of Dayton, Ohio

DESCRIPTORS-- / *statistical analysis/ statistics/ *curve fitting/ experimental data/ calculations/ calibrations/ *mathematics/ curves/ mathematical analysis/ methodology/ instruction/ *correlation techniques/ *nonlinear systems/ coefficients

IDENTIFIERS--/ *regression analysis/ *least squares method/ orthogonal polynomials

R202885X68A DYNAMIC ANALYSIS BY MATRIX DECOMPOSITION

Matrix eigenvalue problems occur in many fields and constitute an important class of problems in numerical analysis. A method is presented for extracting eigenvalues and eigenvectors of a system, using a combination of matrix iteration and matrix decomposition. Incorporation of the matrix decomposition scheme with matrix iteration makes this method a powerful tool for computer analysis of large systems. Shifting the origin of eigenvalues can lead to convergence of eigenvalues and eigenvectors of the system in any desired region of interest. A new technique is presented for simultaneously extracting 2 or 3 close eigenvalues frequently occurring in the proximity of a new origin of eigenvalues to which the computations shifted. This method is satisfactory for any valid structional stiffness matrix. In equations defining the matrix iterative procedure, the matrix must be symmetrical. Results have been compared to other standard techniques such as Jacobi and Householder-QR Methods. In all cases, accuracy compared favorably within the precision of the number of digits used in calculations.

R202885X68A

Rosen, Richard and Rubinstein, Moshe F

DYNAMIC ANALYSIS BY MATRIX DECOMPOSITION

Proc Amer Soc Civil Eng, J Eng Mech Div, Vol 94, No EM2, pp 385-395, Apr 1968. 11 p, 1 fig, 3 ref, 2 append

University of California, Los Angeles
Mechanics Research Inc, El Segundo, Calif

DESCRIPTORS-- / dynamics/ *engineering mechanics/ matrix algebra/ symmetry/ *numerical method/ *mathematical analysis/ *structural analysis/ vibrations/ resonance/ stiffness

IDENTIFIERS-- / *matrix methods (structural)/ *eigenvalues/ iteration method/ stiffness matrix/ dynamic stability/ dynamic response

R202876 68A AUTOMATIC RECORDING OF HYDROMETRIC DATA
The Devon River Authority has designed and constructed and is operating an automatic weather station, and a river water quality monitoring station. Sensors are included at the former for temperature, humidity, wind speed, solar radiation, and rainfall, and at the latter for temperature, dissolved oxygen, conductivity, pH, and suspended solids. Outputs from each sensor are fed into a Limpet Logger after suitable trimming to make them acceptable to the sensitivity range of the recording instrument. The Authority's experience with the Logger ranges from a prototype version with a single channel, modified to provide for a multichannel input, to the latest 10-channel version. Some problems encountered and success realized with the sensors are discussed. The Authority and Logger manufacturer, working as a joint venture, are developing prototype commercial package units. Magnetic tape records from the recorder can be translated into printout data or recorded on computer compatible tape.

R202876 68A

Hall, D G; Prain, A F; Hoer, J J

AUTOMATIC INSTRUMENTATION FOR HYDROMETRIC DATA OBSERVATION

Water Water Eng, Vol 72, No 864, pp 51-57, Feb 1968. 7 p, 2 fig, 6 photo

Devon River Authority, Glasgow, Scotland

DESCRIPTORS-- / *weather stations/ water quality/ *sensors/ *recording systems/ instrumentation/ wind (meteorology)/ solar radiation/ rain gages/ temperature/ humidity/ thermometers/ suspended solids/ pH/ measuring instruments/ dissolved oxygen/ radiation measurement/ automatic control/ *hydrometeorological station/ hydrology
IDENTIFIERS-- / foreign research/ Scotland

R202887X68A SPATIAL DISTRIBUTION OF STORM RAINFALL
A small experimental catchment basin in northern England was studied to investigate: (1) the network of nonrecording and recording rain gages required to give reliable qualitative impressions of spatial distribution of rainfall, and (2) the use of such a network to give improved estimates of average areal precipitation on the catchment by reinforcing the rainfall data from a few gages with prior knowledge of rainfall distribution. Spatial rainfall distribution was a function of the interplay between surface wind and topography. Variation in position of rain-shadow areas on the leeward side of hill barriers is governed by surface-wind direction. Areal extent and nature of rain-shadow areas are extremely variable and dependent on instability induced in the atmospheric boundary layer by the orographic barrier. This induced instability is a function of surface-wind speed. With access to rain gages and surface-wind information, a reasonable estimate can be made of average areal storm rainfall over the catchment basin.

R202887X68A

Collinge, V K and Jamieson, D G

THE SPATIAL DISTRIBUTION OF STORM RAINFALL

J Hydrol, Vol 6, No 1, pp 45-57, Jan 1968. 13 p, 7 fig, 2 tab, 6 ref

Water Resource Board, Reading, England; University of Newcastle upon Tyne, England
DESCRIPTORS--/ *rainfall/ distribution/ forecasting/ *watersheds/ rain gages/ networks/ meteorology/ rainfall intensity/ recording systems/ topography/ wind (meteorology)/ telemetry systems/ *flood forecasting/ *storms/ hydrology/ *runoff forecasting

IDENTIFIERS-- / *spatial distribution/ catchments

R202865X68A POWER PLANNING FOR SOUTH CENTRAL BRAZIL

A survey of the hydroelectric power potential of South Central Brazil is described. The survey was started Nov 1962, fieldwork completed Dec 1966, and the final report issued Jan 1967. The hydraulic resources survey consisting of 3 principal parts was: (1) to define the hydroelectric potential of the major river basins in South Central Brazil, to establish a preliminary classification of economic priority of development, and to consider the possibilities of multipurpose development for irrigation, navigation, flood control, and municipal water supply; (2) to establish technical feasibility of some of the most promising sites; and (3) to assist in a hydrometeorological survey, including a comprehensive review of available data and establishment of a basic network of hydrometric stations. Inventories of this survey contain power potentials and cost data on 231 power and storage sites with 213,000-cu m storage capability and 32,500-mw power potential. Details are given of power studies, available hydro resources, development of a regional plan for ehv transmission, thermal power, comparative costs, and program development.

R202865X68A

Cotrim, John R and Sexton, Jack K

THE POWER STUDY OF SOUTH CENTRAL BRAZIL

Water Power, Vol 20, No 2, pp 56-66, Vol 20, No 3, pp 101-108, Feb, Mar 1968. 15 p, 4 fig, 9 tab

Montreal Engineering Co, Ltd, Canada; Central Eletrica de Furnas, (Brazil)

DESCRIPTORS--/ planning/ *hydroelectric power/ project planning/ *river basin development/ feasibility studies/ electric power costs/ electric power demand/ multiple purpose projects/ multiple use/ water resources/ preliminary investigations/ storage/ municipal water/ foreign projects/ reconnaissance surveys

IDENTIFIERS--/ Brazil/ *hydroelectric power surveys/ economic growth/ site selection/ *hydroelectric resources

R202910 67A KINETICS OF METHANE FERMENTATION

Anaerobic waste treatment is a biological process employed in the stabilization of municipal sewage sludges and organic industrial wastes. A high degree of empiricism presently exists in the design and operation of anaerobic treatment systems. To design such systems on a more rational and scientific basis, increased knowledge of process kinetics is needed. This study evaluated the kinetics of the methane fermentation step, the step generally considered to be the slowest or rate limiting step in the process. Experimental results were evaluated in the context of a widely used mathematical model of methane fermentation kinetics. The results of this study provide a rational approach to the design and operation of anaerobic digesters treating soluble wastes. Such an approach involves: (1) choosing a performance objective in the form of a treatment efficiency or effluent quality; and (2) calculating the solids retention time necessary to obtain this objective. Federal Water Pollution Control Administration Research Grant WP-00584, September 1963 to February 1967. Has 94 references.

R202910 67A

Lawrence, Alonzo W and McCarty, Perry L

KINETICS OF METHANE FERMENTATION IN ANAEROBIC WASTE TREATMENT

Department of Civ Eng Tech Rep 75, Stanford Univ, Feb 1967. 193 p, 30 fig, 40 tab, 94 ref, 6 append

Stanford University, Calif

DESCRIPTORS--/ kinetics/ bibliographies/ sanitary engineering/ sewage treatment/ *sludge digestion/ *fermentation/ *anaerobic digestion/ mathematical models/ *methane/ *waste treatment/ *methane bacteria/ *anaerobic bacteria

IDENTIFIERS--/ *fatty acids

R202919 67A CHROMATIUM IN SEWAGE PONDS
An investigation was made of ecological factors influencing growth of purple sulfur bacteria, particularly chromatium and thiopedia. By utilizing radioactive sulfide indications were that sulfide uptake is enzymatic in nature. Fructose, glucose, acetate, pyruvate, and propionate were shown to be capable of supplying electrons for metabolism of thiopedia. Fructose, glucose, acetate, pyruvate, lactate, formate, and propionate can supply electrons for the metabolism of chromatium. These organic compounds with the exception of pyruvate were not capable of supplying carbon for synthesis of new cell material. Thiopedia appears to be capable of utilizing substrates and producing new cell material at slightly higher rates than chromatium. Both organisms seem to exhibit a slight preference for thiosulfate over acetate. Concentration of sodium thiosulfate above 500 ppm does not appear to be a critical growth factor, but growth increases to a maximum value at 6000 ppm of this compound for chromatium. Thiopedia growth levels off at higher concentration. These concentrations are extremely high compared to those present in most natural waste effluents and may represent a limiting factor if other reduced sulfur compounds are not present. Has 48 references.

R202919 67A

May, Donald S and Stahl, John B

THE ECOLOGY OF CHROMATIUM IN SEWAGE PONDS

Washington State University Bulletin 303, 1967. 73 p, 8 tab, 22 fig, 48 ref

Washington State University, Pullman

DESCRIPTORS-- / ecology/ sewage treatment/ cultures/ biochemical oxygen demand/ *sewage bacteria/ *sulfur bacteria/ growth rates/ environmental effects/ *sewage lagoons/ anaerobic digestion/ anaerobic bacteria/ odor/ photosynthetic bacteria

IDENTIFIERS-- / *chromatium/ *thiopedia

R202922 67A ANAEROBIC FILTER FOR WASTE TREATMENT
The anaerobic filter efficiently treats dilute soluble organic wastes at loadings comparable to those applied to other biological treatment processes. Nominal temperature operation is possible because a long biological solids retention time can be maintained. Solids production is exceptionally low so that the filter can be operated for long periods of time without sludge wasting. The effluent from the anaerobic filter is low in suspended solids and these settle readily. Sulfides resulting from sulfate reduction, and remaining biochemical oxygen demand in the treated effluent can be effectively removed by aeration or other suitable means. The low head loss through the filter indicates power requirements for filter operation are almost nonexistant. In addition the methane released from decomposition of the wastes represents a useable power supply. The combined advantages of the anaerobic filter suggest the possibility of a treatment plant with low maintenance requirements, and one in which sludge handling and disposal problems are minimized. This investigation was supported by Federal Water Pollution Control Administration Research Grant WP-000584.

R202922 67A

Young, James C and McCarty, Perry L

THE ANAEROBIC FILTER FOR WASTE TREATMENT

Pap, Purdue Ind Waste Conf, Purdue Univ, West Lafayette, Ind, May 1967. 29 p, 7 fig, 3 tab, 9 ref, disc

Stanford University, Palo Alto, Calif

DESCRIPTORS-/ filters (fluid)/ filtration/ filter stones/ sanitary engineering/ sewage treatment/ microorganisms/ *waste treatment/ treatment facilities/ filters/ trickling filters/ anaerobic conditions/ *anaerobic digestion/ anaerobic bacteria/ *organic wastes/ decomposing organic matter/ biological treatment/ biodegradation
IDENTIFIERS-- / *anaerobic filters/ anaerobic processes

R202933 67A NITROGEN CYCLE IN FACULTATIVE PONDS

A laboratory model of a facultative waste stabilization pond was used to investigate nitrification and denitrification of milk wastes as a function of depth. The model was operated on a continuous flow basis using dry milk product as feed. Organic and hydraulic loading were kept constant. General pond characteristics were evaluated by measuring dissolved oxygen, pH, oxidation reduction potential and temperature profiles; chemical oxygen demand and different forms of nitrogen were monitored at frequent intervals during the test period to determine depth profiles of these parameters as well as COD removal efficiencies and nitrogen transformations. A rapid removal of organics occurred in or near the bottom sediment layer with a correspondingly high degree of ammonification. Above the bottom layer the contents remained essentially unchanged except for minor variations due to algal density fluctuations. Detectable concentrations of nitrates were not found during the test period, but a substantial amount of nitrogen was lost from the liquid fraction. COD and nitrogen removals from the waste, as measured by overflow, were 85 and 44%, respectively. Has 38 references.

R202933 67A

Aguirre, Jorge and Gloyna, E F

NITRIFICATION AND DENITRIFICATION IN A MODEL WASTE STABILIZATION POND

Center Res Water Resources Tech Rep EHE-05-6701, May 1967. 82 p, 22 fig, 5 tab, 38 ref, 2 append

University of Texas, Austin

DESCRIPTORS-- / waste disposal/ milk/ nitrogen/ sanitary engineering/ algae/ sewage treatment/ microorganisms/ bacteria/ *nitrification/ *oxidation lagoons/ model studies/ eutrophication/ waste treatment/ *sewage lagoons/ *denitrification/ nutrients/ bibliographies

IDENTIFIERS-- / *waste stabilization ponds/ sewage stabilization/ *milk wastes

R202904 67A SWELLING BEHAVIOR OF COMPACTED CLAY SOILS

Basic concepts of soil chemistry, soil physics, and soil structure relating to the expansive behavior of compacted clays are examined. A model of the swell pressure mechanism is presented. Equations are derived for the vertical and horizontal components of swell pressure in compacted clay soils with flocculated and dispersed structures in terms of average particle orientation and net interparticle swell pressure. Theoretical values of swell pressure agree closely with experimental values, and the concepts of soil structure offer a reasonable explanation for swelling behavior of compacted clays. Thixotropic hardening is one of the most important factors determining swelling behavior of undisturbed and remolded clays. Results of the investigation were related to fundamental aspects of clay colloid chemistry and soil structure. Practical implications of the results are indicated, with particular reference to fundamental physicochemical and engineering properties of clay soils. A series of tests indicated that kaolinite clays, unlike montmorillonite, do not exhibit thixotropic characteristics. Has 20 references.

R202904 67A

Nalezny, Charles L and Li, Mo C

EFFECT OF SOIL STRUCTURE AND THIXOTROPIC HARDENING ON THE SWELLING BEHAVIOR OF COMPACTED CLAY SOILS

Highway Res Rec, No 209, pp 1-22, 1967. 22 p, 22 fig, 20 ref, disc

Bell Telephone Laboratories, Murray Hill, N J; New York University, New York

DESCRIPTORS-- / *soil structure/ *thixotropy/ *swelling/ *clays/ kaolin/ clay minerals/ *expansive clays/ soil chemistry/ soil physics/ *soil physical properties/ soil chemical properties/ moisture content/ soil compaction/ ion exchanges/ montmorillonites/ laboratory tests/ cohesive soils/ soil mechanics/ bibliographies

IDENTIFIERS-- / *swelling pressures/ Van Der Walls Force/ compacted soils

R202882X68A AESTHETICS IN POWER TRANSMISSION

The Bureau of Reclamation's policy and criteria for improving the appearance of power transmission facilities are summarized. Environmental planning in locating transmission lines, switchyards, and substations is discussed. The concept and development of simplified low silhouette designs for steel structures employing rigid-frame-type structures to achieve optimum aesthetic effects within economic limits is presented. Use of color and landscaping and ways to improve existing installations are suggested. Photographs and drawings illustrating the criteria being implemented to improve appearance of power transmission facilities are included.

R202882X68A

Rose, Edwin and Covington, Dwight A

IMPROVED APPEARANCE OF POWER TRANSMISSION FACILITIES

Amer Soc Civil Engs Environ Eng Conf, Chattanooga, Tenn, May 13-17, 1968. 42 p, 20 fig

Bureau of Reclamation, Denver, Colorado

DESCRIPTORS-/ *aesthetics/ transmission lines/ transmission towers/ *substations (electrical)/ steel structures/ environment/ *transmission (electrical)/ policy matters/ design criteria/ topography/ right-of-way/ herbicides/ clearing/ colors/ structural design/ switchyards (electrical)
IDENTIFIERS--/ *beautification/ *landscaping/ land clearing

R202884X68A STOCHASTIC MODEL OF EARTHQUAKE MOTIONS

Eight strong-motion accelerograms, recorded on firm ground and at moderate epicentral distances, are studied to develop a reasonable stochastic representation of the time history of ground accelerations during strong earthquakes. Results indicate that nonstationary random processes are needed to describe the records over durations of interest in structural response calculations. A nonstationary Gaussian filtered shot-noise process was examined for this purpose. The member functions of the mathematical model and their associated linear response spectra were compared with corresponding information obtained from recorded accelerograms. On this basis, a nonstationary Gaussian filtered shot-noise process, with a second-order filter, was proposed for stochastic simulation of strong-motion earthquakes. Has 23 references.

R202884X68A

Amin, Mohammad and Ang, Alfredo H S

NONSTATIONARY STOCHASTIC MODEL OF EARTHQUAKE MOTIONS

Proc Amer Soc Civil Eng, J Eng Mech Div, Vol 94, No EM2, pp 559-583, Apr 1968. 21 fig, 3 tab, 23 ref, 2 append

University of Illinois, Urbana

DESCRIPTORS--/ *earthquakes/ seismic waves/ seismology/ accelerographs/ mathematical analysis/ noise/ probability/ vibrations/ models/ design tools/ kinetics/ geophysics/ structural behavior/ *seismic design

IDENTIFIERS-- / mathematical models/ *stochastic models/ earthquake engineering/ *random vibration theory/ seismic studies

R202905X68A INFLUENCE SURFACES FOR CONTINUOUS PLATES

Influence surfaces are valuable aids for computating moments in plates caused by concentrated loads. Influence surfaces presented were drawn from influence coefficients computed by a numerical procedure coded for a digital computer. Four moment locations were considered in the interior panel of a continuous structure composed of 9 square panels, arranged 3 by 3, and supported along the edges by rigid columns. When supporting beams have zero flexural and torsional stiffness, the 9-panel structure is representative of a plate supported by rigid columns at the corners of each panel. When beams are considered to have stiffness, the structure analyzed is representative of a plate continuous on all 4 edges and supported on deflecting beams and rigid columns at the corners. Accuracy of the computations was checked by comparing computer results with those obtained by a more exact method of solution. The comparison indicated that the finite difference method rounds off discontinuities occurring in the more exact solution; however, a comparison of values from the 2 methods at some distance from a discontinuity indicated no difference between them.

R202905X68A

Woodring, Richard E and Siess, Chester P

INFLUENCE SURFACES FOR CONTINUOUS PLATES

Proc Amer Soc Civil Eng, J Struct Div, Vol 94, No ST1, pp 211-226, Jan 1968. 16 p, 16 fig, 1 tab, 9 ref, append

University of Illinois, Urbana

DESCRIPTORS-/ *plates/ *structural engineering/ stiffness/ surfaces/ beams/ bending moments/ moment distribution/ finite differences/ *flat plates/ computer programming/ loads/ *structural design/ *structural analysis/ continuous structures/ discontinuities

IDENTIFIERS-/ *influence lines/ *influence surfaces/ finite difference method

R202930 67A TRANSPIRATION CONTROL BY STOMATA

Plant canopies are not passive evaporating surfaces. The regulation of water loss from plants is an important function of leaf stomata, and significant stomatal regulation occurs throughout the range of leaf-pore diameters. Leaf pores do not interfere with one another to any significant extent in the conductance of water vapor or other gases. The diffusive conductance of small pores is more sensitive to diameter changes at the larger apertures, thus permitting carbon dioxide exchange for photosynthesis without dehydration of the leaf mesophyll. In still air the external resistance over broad leaves limits control by stomata, but light drafts usually minimize this effect in field situations. Characteristic diffusion coefficients for leaf types, based on a careful study of leaf microstructure, physiology, and seasonal variation, are a rational basis for cover-type conversions or biochemical controls to reduce water loss. Has 34 references.

R202930 67A

Lee, Richard

THE HYDROLOGIC IMPORTANCE OF TRANSPIRATION CONTROL BY STOMATA

Water Resources Res, Vol 3, No 3, pp 737-752, 3rd Quarter, 1967. 16 p, 8 fig, 9 tab, 34 ref

Pennsylvania State University, University Park

DESCRIPTORS-/ evaporation/ diffusion/ water yield/ bibliographies/ water vapors/ consumptive use (water)/ biology/ absorption/ membranes/ pores/ *evapotranspiration/ *stomata/ *transpiration control/ microenvironment/ watershed management/ *transpiration/ leaves

IDENTIFIERS-/ multiperforate membranes/ *leaf resistance

WATER-PLANT-SOIL RELATIONS

R202932 67A MICROCLIMATIC MODIFICATION BY WATER SPRAY
An experiment to evaluate the effect of a curtain of water mist on microclimate of crops and soil is discussed. The objectives of the study are to measure the turbulent transport of momentum, heat, and water vapor as influenced by an ultrafine water spray. The data to be collected are expected to support theoretical equations describing this phenomenon of outdoor air conditioning. The study also will evaluate the use of mist spray to alleviate heat stress on crops, livestock, and humans; to reduce wind erosion of soil; and to prevent frost damage. Special instrumentation, developed for the study, is described and includes the mist spraying apparatus, the meteorological sensors, and an automated data acquisition system for collecting and transferring the data to a high speed digital computer. Has 20 references.

R202932 67A

Harrington, James B, Jr

MICROCLIMATIC MODIFICATION BY WATER SPRAY

Department of Agr Eng, Michigan State Univ Termination Rep OWRR A-004-MICH, Aug 1967. 16 p, 4 fig, 20 ref

Michigan State University, East Lansing

DESCRIPTORS-- / *microclimatology/ humidity/ erosion control/ spraying/ instrumentation/ bibliographies/ evaporation/ air temperature/ fungus/ climatology/ crops/ weather modification/ meteorological instruments/ micrometeorology/ advection/ water cooling/ *mist irrigation/ frost prevention/ mist
IDENTIFIERS-- / microclimate modification

WATER POLLUTION

R202909 67A COST OF CLEAN WATER: MEAT PRODUCTS INDUSTRY
Industrial Waste Profile No 8 is concerned with meat products. This study is part of the National Requirements and Cost Estimate Study required by the Federal Water Pollution Control Act as amended. The act requires a comprehensive analysis of the requirements and costs of treating municipal and industrial wastes and other effluents to attain prescribed water quality standards. The Industrial Waste Profiles were established to describe the source and quantity of pollutants produced by each of the 10 industries studied. The profiles were designed to provide industry and government with information on the costs and alternatives involved in dealing effectively with the industrial water pollution problem. They include descriptions of the costs and effectiveness of alternative methods of reducing liquid wastes by changing processing methods, by intensifying use of various treatment methods, and by increasing utilization of wastes in byproducts or water reuse in processing. They also describe past and projected changes in processing and treatment methods. This profile on meat products is in 2 parts. Part I deals with meatpacking and Part II with poultry processing. Has 71 references.

R202909 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO 8, MEAT PRODUCTS

Federal Water Pollut Contr Admin Publication IWP-8, Sept 1967. 50 p, 50 tab, 7 fig, 71 ref

Wichita State University, Kansas

DESCRIPTORS-- / wastes/ water reuse/ waste disposal/ industrial plants/ economics/ costs/ industries/ bibliographies/ pollution abatement/ water pollution/ *industrial wastes/ *treatment facilities/ *waste water treatment/ waste water disposal/ byproducts/ *waste treatment/ *water pollution sources/ pollutants
IDENTIFIERS-- / poultry/ *poultry processing industry/ *meat processing industry

R202911 68A ACID MINE DRAINAGE STUDY
A small drift coal mine in Vinton County, Ohio, was characterized and instrumented to permit a detailed study of the influence of oxygen concentration, microbiological factors, and hydrologic features on rate of pyrite oxidation within the system. This experimental mine will be treated as a pilot-scale reactor to obtain information in a natural environment on the kinetics of the reaction responsible for acid mine drainage. Six observation wells were dug and core samples taken at selected points surrounding the mine to establish ground water table and the aquifer supplying the mine. Base rate data of acid runoff as a function of waterflow rate and water level in observation wells were collected. The mine was sealed and maintained under a slight positive pressure of nitrogen. Oxygen concentration dropped to less than 2% in 3 months. When "sealed" in a conventional manner, the atmosphere in the mine never dropped below 10% oxygen after being closed for several years. Acid runoff decreased approximately 50% after 6 months under nitrogen pressure. The response time of the mine to imposed changes and characterization of reaction sites, in terms of physical and chemical environment, as well as location, are now being studied.

R202911 68A

Smith, E E and Shumate, K S

DEVELOPMENT OF A NATURAL LABORATORY FOR THE STUDY OF ACID MINE DRAINAGE

Water Resources Center, Ohio State Univ, Feb 1968. 35 p, 15 fig, 4 tab, 4 ref

Ohio State University, Columbus

DESCRIPTORS-- / pilot plants/ mass transfer/ *acids/ *mines/ oxygen/ water pollution/ oxidation/ pyrites/ *mine drainage/ *acid mine water/ water pollution control/ acid bacteria/ chemical reactions/ microbiology/ *coal mine wastes/ coal mines/ observation wells/ drainage water

IDENTIFIERS--/ *pyrite oxidation

R202912 68A COST OF WASTE TREATMENT FACILITIES
This volume of the Cost of Clean Water reports contains a tabular breakdown of estimated construction costs of municipal treatment works and sanitary sewers, and the operation and maintenance costs of treatment works. The data are shown for each of the 50 States and District of Columbia and the Nation's major river basins as described by the Water Resources Council. The purpose of this volume is to make available for easy reference statistical data on construction requirements and costs by state and water resources regions. Breakdowns of the capital outlay components for upgrading of facilities, for construction of new facilities for untreated wastes, for increases in population and for depreciation replacement are also shown geographically for the 5-yr period, 1969-1973. The volume also gives similar geographical compilations of the operation and maintenance costs that would be associated with such a construction schedule. Finally, there is a summary of states and regions of the need for sanitary sewers with estimates of the requirements and costs of sewering presently unsewered urban populations and constructing sewers for increases in the urban population.

R202912 68A

Anon

COST OF CLEAN WATER, VOL IV: STATE AND MAJOR RIVER BASIN MUNICIPAL TABLES

Federal Water Pollut Contr Admin Rep, Jan 1968. 44 p, 2 fig, 38 tab, append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ *costs/ economics/ *construction costs/ *sewage treatment/ *sewers/ operation and maintenance/ states (geographical)/ *sewage works/ municipal wastes/ water quality control/ waste water disposal/ *treatment facilities/ *waste treatment/ cost analysis/ cost trends/ *maintenance costs/ *operating costs
IDENTIFIERS--

R202913 67A HOUSEBOAT WASTES, COLLECTION & TREATMENT
Methods of collection and treatment for houseboat and moorage wastewaters are reviewed. Several methods using alternative materials are considered and approximate installed costs are given. Emphasis is on solution of the problem in the State of Oregon but information developed is applicable in adjacent states and elsewhere with appropriate adjustments.

R202913 67A

Clark, B D

HOUSEBOAT WASTES METHODS FOR COLLECTION AND TREATMENT

Federal Water Pollut Contr Admin Rep, Pacific NW Water Lab, June 1967. 83 p, 15 fig, 7 tab, 10 ref, append

Federal Water Pollution Control Administration, Corvallis, Oreg

DESCRIPTORS--/ *boats/ *wastes/ costs/ *waste disposal/ water pollution/ pollution abatement/ sewage/ sewage disposal/ sewage treatment/ Oregon/ domestic wastes/ *waste treatment

IDENTIFIERS-- / *houseboats/ *moorages/ floating structures

R202914 67A PHOTOSYNTHETIC REOXYGENATION
This dissertation describes the potential reduction of dissolved oxygen in ponds and streams due to chlorophyll inhibition resulting from certain industrial wastes. Emphasis is placed on the laboratory techniques developed for this study and the changes that should be incorporated in waste stabilization pond designs. Has 78 references.

R202914 67A

Huang, Ju-Chang and Gloyna, Earnest F

EFFECTS OF TOXIC ORGANICS ON PHOTOSYNTHETIC REOXYGENATION

Center Res Water Resources Tech Rep, August 1967. 163 p, 64 fig, 24 tab, 78 ref, 3 append

University of Texas, Austin

DESCRIPTORS-- / *dissolved oxygen/ bibliographies/ organic compounds/ oxidation/ *photosynthesis/ algae/ laboratory tests/ reviews/ *toxicity/ industrial waste treatment/ *chlorophyll/ *industrial wastes/ waste treatment/ oxidation lagoons/ photosynthetic oxygen/ oxygenation

IDENTIFIERS--/ *chlorophyll inhibition/ *waste stabilization ponds

R202915 66A GUIDE TO COMMON DIATOMS

Descriptions of the diatom species which are most frequently encountered at Water Pollution Surveillance System Stations have been assembled in this illustrated guide prepared to serve as a bench reference for laboratory biologists being trained in diatom identification. The guide also contains a glossary and generic key. The key was constructed with the beginner in mind, and is based entirely on the shape and markings of the diatom cell wall as observed in material mounted in hyrax. No attempt was made to place the taxa in their proper phylogenetic order.

R202915 66A

Anon

GUIDE TO THE COMMON DIATOMS AT WATER POLLUTION SURVEILLANCE SYSTEM STATIONS

Federal Water Pollut Contr Admin Rep, Washington, DC, June 1966. 98 p, 164 fig, 2 chart

Federal Water Pollution Control Administration, Cincinnati, Ohio

DESCRIPTORS--/ plankton/ algae/ classifications/ aquatic life/ *diatoms/ microscopy/ microorganisms/ dictionaries/ *systematics/ phytoplankton/ aquatic plants/ *aquatic algae/ pollutant identification/ water pollution control

IDENTIFIERS--

R202916 67A EFFECTS OF WATERSHED PRACTICES ON STREAMS

This work supported by the Federal Water Pollution Control Administration's Research Grant WP423 has had the following objectives: (1) to determine the significance of stream temperature changes associated with logging, (2) to predict stream temperature in small mountain streams, (3) to determine the changes in suspended sediment loads prior to and after logging, (4) to determine the factors controlling algal productivity in small streams and the effects of logging on this basic source of food energy for fish populations, and (5) to determine the effects of logging on the stream as a habitat for populations of anadromous and resident fish. The work reported was undertaken primarily in experimental watersheds established in the Alsea basin of the Oregon Coast Range about 12 mi south of Toledo, Oregon, and approximately 10 mi from the Pacific Ocean. The watersheds were selected for the predominance of commercial forest cover and their significance as spawning streams for coho salmon. One watershed was partially logged with 3 small clearcuts, another was completely clearcut, and the third remained uncut as a control. The effects of the logging operation are still being evaluated and this progress report is preliminary. Has 20 references.

R202916 67A

Hall, James D and Krygier, James T

STUDIES ON EFFECTS OF WATERSHED PRACTICES ON STREAMS: PROGRESS REPORT

Progr Rep, Agr Exp Sta, Forest Res Lab, Oregon State Univ, May 1967. 95 p, 23 fig, 23 tab, 20 ref, append

Oregon State University, Corvallis

DESCRIPTORS--/ *lumbering/ algae/ water quality/ bibliographies/ fish/ *logging/ watersheds/ *streams/ soil erosion/ suspended sediments/ road construction/ *water temperature/ *clear-cutting/ suspended load/ water quality control/ watershed management/ *forest management/ *sediment yield/ *demonstration watersheds

IDENTIFIERS--/ *stream temperature

R202918 67A SELECTED FWPCA PUBLICATIONS

The leaflets and publications listed have been selected to increase the average reader's knowledge of an environmental problem which is assuming greater importance each year. The Federal Water Pollution Control Administration's publications are listed under the following headings: (1) Publications for the General Reader; (2) Pubications Transferred to Federal Water Pollution Control Administration from Public Health Service; (3) Advanced Waste Treatment Research Publications and Environmental Health Series Reports; (4) Publications for Readers with Special Interests, and (5) Miscellaneous Non-numbered Publications.

R202918 67A

Anon

WATER AND WATER POLLUTION CONTROL: A SELECTED LIST OF PUBLICATIONS

Federal Water Pollut Contr Admin Rep, Oct 1967. 16 p

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ *bibliographies/ *water pollution/ pollution abatement/ water quality/ documentation/ *water pollution control/ water quality control/ *publications/ waste treatment

IDENTIFIERS--

R202920 67A POLLUTION CONTROL COST SHARING WITH INDUSTRY

This report summarizes an evaluation of the advisability of further assistance for industry and possible alternative approaches for such assistance. The report is part of a larger effort to look at the economic impact of pollution abatement as directed by the President. The report is divided into 6 parts: (1) Summary; (2) Recommendations; (3) Magnitude and nature of present Federal assistance to industry; (4) Summary of the expenditures currently made by industry; (5) Estimates of costs of air and water abatements; and (6) Analysis of several proposed Federal subsidies. The average additional annual costs caused by higher levels of pollution abatement are estimated to be significant but relatively small for all manufacturing firms. Moreover, Federal assistance to industry is already sizeable and is growing especially in the area of R&D intended to lower abatement costs. Therefore the need and desirability of additional assistance for industry should be judged on the basis of hardship or burden on particular industries, firms or plants (or hardship on particular communities) caused by abatement actions rather than on the burden to industry as a whole.

R202920 67A

Anon

COST SHARING WITH INDUSTRY: SUMMARY REPORT OF THE WORKING COMMITTEE ON ECONOMIC INCENTIVES (REVISED)

Federal Coordinating Comm on Econ Impact Pollut Abatement, Washington, DC, Nov 1967. 37 p, 11 tab

DESCRIPTORS--/ economics/ *costs/ *pollution abatement/ water quality/ industrial plants/ *industries/ electric powerplants/ water pollution/ *water pollution control/ *financing/ treatment facilities/ grants/ *industrial wastes/ water quality control/ waste water disposal/ air pollution

IDENTIFIERS-- / *Federal assistance/ air pollution control/ incentives

R202921 68A ANALYSIS OF WATER POLLUTION CONTROL COSTS
This is a detailed analysis of the national requirements and costs of water pollution control. The report is in 3 parts: Part I, Municipal Requirements and Cost Estimates; Part II, Industrial Requirements and Cost Estimates; Part III, Other Effluent Requirements and Cost Estimates. This report comprises Volume II of a 4 volume series on the cost of water pollution control. Has 255 references.

R202921 68A

Anon

COST OF CLEAN WATER, VOL II: DETAILED ANALYSES

Federal Water Pollut Contr Admin Rep, Jan 1968. 244 p, 11 fig, 69 tab, 255 ref, 5 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ *costs/ waste disposal/ *pollution abatement/ sewage treatment/ construction costs/ capital costs/ financing/ water quality control/ waste water disposal/ *treatment facilities/ municipal wastes/ industrial wastes/ operating costs/ maintenance costs/ *water pollution control/ bibliographies
IDENTIFIERS--

R202923 66A SANITARY SIGNIFICANCE OF FECAL COLIFORMS
This compilation of previously published research papers by personnel of the Microbiological Activities, Basic and Applied Sciences Program, Cincinnati Water Research Laboratory, (Robert A Taft Sanitary Engineering Center), brings together in one volume much of the information concerning fecal-coliform bacteria that has appeared in various scientific journals. The material is organized into 7 chapters that include background, methodology, and occurrences in warmblooded animals including man, fresh water fish, vegetation, insects, and soil. The final section covers the interpretation and significance of fecal-coliform bacteria in water pollution studies. Has 153 references.

R202923 66A

Geldreich, E E

SANITARY SIGNIFICANCE OF FECAL COLIFORMS IN THE ENVIRONMENT

Federal Water Pollut Contr Admin Publication WP-20-3, Washington, DC, 1966. 122 p, 4 fig, 35 tab, 153 ref

Robert A Taft Sanitary Engineering Center, Cincinatti Water Research Laboratory, Ohio

DESCRIPTORS--/ fish/ insects/ soils/ vegetation/ *water pollution/ sanitation/ *bacteria/ stream pollution/ chemical analysis/ sewage/ microorganisms/ animals/ *coliforms/ fresh water fish/ oxidation lagoons/ sewage lagoons/ bibliographies

IDENTIFIERS--/ *fecal coliforms

R202927 68A ECONOMIC IMPACT OF WATER QUALITY STANDARDS
This study presents and evaluates the available data dealing with the requirements of state and local governments to achieve the standards of the Federal Water Pollution Control Administration program; it places the program in its perspective relative to other, competing issues confronting the affected units of government; and it appraises the major financial and legal problems which will be encountered in implementing the attendant standards. The study was prepared pursuant to Federal Water Pollution Control Administration Contract 14-12-142.

R202927 68A

Anon

THE ECONOMIC IMPACT OF THE CAPITAL OUTLAYS REQUIRED TO ATTAIN THE WATER QUALITY STANDARDS OF THE FEDERAL WATER POLLUTION CONTROL ACT

Eastman Dillon, Union Secur & Co Study, New York, N Y, Jan 1968. 227 p, 29 tab, 1 fig, 3 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ economics/ costs/ pollution abatement/ *water quality/ *capital costs/ standards/ construction costs/ water pollution/ grants/ water pollution control/ financing/ *water quality control/ treatment facilities/ cost analysis/ cost trends/ *water quality act/ federal jurisdiction/ state jurisdiction/ *legal aspects
IDENTIFIERS--/ *water quality standards

R202931 67A WATER POLLUTION FROM BEET SUGAR INDUSTRY
Primary attention is focused upon the beet sugar industry in the South Platte River Basin. Beet sugar wastes are the largest source of pollution within the area. Ten sugar factories are dispersed throughout the region and affect water quality over 300 mi of basin streams. This report comprises 5 major parts. Section 1 consists of introduction and background to the problem, and description of process operations. Section 2 gives the results of industrial surveys and status evaluation of each of the 10 factories in the basin. Section 3 discusses total factory waste loads before and after treatment. Section 4 describes the bacteriological aspects of sugar beet waste pollution across the country. Section 5 offers a comprehensive review and evaluation of waste abatement and treatment throughout the industry, both in the U S and abroad. Has 69 references.

R202931 67A

Anon

THE BEET SUGAR INDUSTRY--THE WATER POLLUTION PROBLEM AND STATUS OF WASTE ABATEMENT AND TREATMENT

Federal Water Pollut Contr Admin Rep, June 1967. 173 p, 50 fig, 16 tab, 69 ref

Federal Water Pollution Control Administration, Denver, Colo

DESCRIPTORS--/ *waste disposal/ *water pollution/ *pollution abatement/ *wastes/ water quality/ *industrial waste treatment/ industrial plants/ *sugar beets/ waste treatment/ treatment facilities/ waste water treatment/ industrial wastes/ bibliographies

IDENTIFIERS--/ *South Platte Riv Basin Colo/ *sugar beet industry/ South Platte River

R202862X68A COMPREHENSIVE RIVER BASIN PLANNING
The National Water Resources Council established by the Water Resources Planning Act of 1965 is directing comprehensive investigations of water and related land resources. These investigations will eventually include the entire United States. These studies are at reconnaissance level of detail for the purpose of developing framework plans. The investigations, conducted by Federal-State groups, will provide for: (1) economic analysis and projections; (2) translation of economic projections into demands for water and related land; (3) assessment of available water for quality and quantity; (4) assessment of available land resources; (5) identification of current and projected water and related land resource problems; (6) development of alternative plans for solution of problems; and (7) identification of critical water problems calling for prompt action. Parameters to be considered in the framework planning are national income, regional development, and quality of environment. Definitions are given and applications are discussed.

R202862X68A

Christensen, Wallace R

COMPREHENSIVE RIVER BASIN PLANNING

Amer Soc Civil Engs Preprint 625, Nat Meeting Transp Eng, San Diego, Calif, Feb 1968. 16 p

Pacific Southwest Region Planning Office, San Bernardino, Calif

DESCRIPTORS--/ *river basin development/ project planning/ feasibility studies/ water resources/ states (geographical)/ economics/ planning/ social values/ environment/ optimum development plans/ water development

IDENTIFIERS--/ Federal agencies/ River Basin Commissions/ National Water Resrcs Coun/ Federal-State cooperation

R202863X68A TRANSPORTATION OF DISTILLED SEA WATER
Distilled water is now generally recognized to be highly corrosive and a difficult material to transport through ordinary water works systems. Experiences at the San Diego and Freeport demonstration sea water distillation plants indicate the addition of polyphosphates and silicates help to protect metals, but alkaline chemicals are needed to protect cement products. Studies are being made at the San Diego Water Test Facility to evaluate various methods for distilled water treatment, probable efficacy under local conditions, and their relative cost and operational complexity. Temperature effects and cooling of distilled water are also discussed. Two product water test programs have been planned for the test facility. One will test various 16-in. dia pipe sections with buffered and unbuffered distilled water. The other will include coupons and small pipe segments using 4 different waters and different velocities.

R202863X68A

Dodson, Roy E

TRANSPORTATION OF DISTILLED SEA WATER

Amer Soc Civil Engs Nat Meeting Transp Eng, San Diego, Calif, Preprint 601, Feb 1968. 19 p, 1 tab, 9 ref

City Department of Utilities, San Diego, Calif

DESCRIPTORS--/ *water transportation/ water delivery/ water treatment/ *water pipes/ distillation/ *demineralization/ *corrosion/ water supply systems/ *corrosion control/ concrete/ buffers (chemistry)/ asbestos cement/ water quality/ cooling/ temperature/ concrete pipes/ pipes/ cast iron

IDENTIFIERS--/ San Diego, Calif/ *distilled water/ desalination plants/ Point Loma Plant, Calif/ water distribution

R202895 68A OPTIMIZING WATER CONVEYANCE SYSTEMS
Widespread plans for regional water supply systems involve transmission of large quantities of water over great distances. For such plans to be feasible, conveyance systems must be optimized and new concepts of operation adopted. Lifts previously considered impossible will be necessary and will require maximum efficiency and reliability of pumping systems. Potential size and distance of projected transmission aqueduct systems are reviewed and possible requirements translated into design goals and objectives for conveyance system optimization. Types of conveyance systems are examined regarding these goals and operational requirements. The controlled-volume concept is reviewed and the need for controls and instrumentation systems established. Current pipeline design practices are analyzed for possible adaptation of other industry standards to water programs. Potential pumping lifts are projected and the present state of the art of hydraulic machinery summarized. Procedures for development of optimum pump systems are given with examples of current applications. Dependent upon cost of purchased power, the present value of 1% efficiency for major water supply programs could exceed $10 million. Gives 19 references.

R202895 68A

Miller, David R and Miller, James P

OPTIMIZING CONVEYANCE SYSTEMS FOR WATER TRANSMISSION

Preprint 603, Amer Soc Civil Eng Nat Meeting Trans Eng, San Diego, Calif, Feb 1968. 28 p, 3 fig, 3 tab, 19 ref

Daniel, Mann, Johnson, and Mendenhall, Los Angeles, Calif

DESCRIPTORS-/ *optimum development plans/ water costs/ water delivery/ *water transportation/ *conveyances/ water resources/ planning/ canals/ pipelines/ tunnels/ automatic control/ pumping plants/ pumps/ project planning/ efficiencies/ bibliographies/ pumped storage/ *water supply systems/
IDENTIFIERS-/ *optimization/ water plans/ *water transfer/ Tehachapi Mts, Calif/ water shortages/ NAWAPA/ pumping

R202900 68A ECONOMIC USE OF WATER
The origin, scope, use, and cost of USSR water resources are discussed. The USSR has the largest resources of fresh water in the world with surface runoff amounting to 4,380 billion cu m annually and operating reserves of groundwater averaging 210 billion cu m annually. However, territorial distribution is unequal with regions of greatest population and industry having less than 20% of the surface runoff. By 1985, capital investments of the country's water resources will amount to 169.4 billion rubles. Agriculture is the heaviest user, consuming 125 billion cu m of water; cities and workers' settlements use 8.4 billion cu m. Approximately 720-750 billion cu m of water pass through hydroturbines yearly. Waste and inefficient use of water are widespread among all users and to encourage greater thrift and economy, a charge is proposed. Tables show water consumption and scheduled water use charges for various agricultural and industrial users.

R202900 68A

Loyter, M

ECONOMIC MEASURES FOR EFFICIENT USE OF WATER RESOURCES

Joint Publications Res Serv Transl 44,270, Feb 1968. 19 p, 6 tab

DESCRIPTORS-/ water supplies/ *water utilization/ water costs/ industrial water/ water resources/ agriculture/ hydroelectric power/ efficiencies/ economics/ foreign countries/ water conservation

IDENTIFIERS-/ fees/ USSR/ *water use

R202925 67A ECONOMIC ANALYSIS OF PUBLIC WATER SUPPLY
Economics of public water supply for 10 firms in the Piscataqua River Watershed were analyzed in terms of the cost of production and distribution, plant size adjustments of waterworks systems, and variation in use. The analysis revealed that management of these firms was usually charging a price for water use based on average cost, computed on the basis of past or historical investment. Such a pricing policy does not provide for the replacement of wornout plant facilities. To provide for replacement costs, and direct the responsibility of cost payment to the actual users of the plant facilities, management was advised to charge a higher average price. Methods chosen to increase a waterworks system capacity determined the direction of average cost. Cost economies were indicated when waterworks expanded capacity by (1) adding wells, (2) adding or replacing pumps and auxiliary equipment, and (3) adding transmission mains. Cost diseconomies were indicated as the result of expanded plant capacity by (1) adding a surface supply, and (2) adding extensive treatment facilities. Cost-trend type of analysis used in this study is useful to management in determining methods of expanding existing waterworks systems and in determining the geographic location of prospective waterworks systems. Has 16 references.

R202925 67A

Forste, Robert H and Bourcier, Donald V

ECONOMIC ANALYSIS OF PUBLIC WATER SUPPLY IN THE PISCATAQUA RIVER WATERSHED--I: AN AVERAGE COST APPROACH

Water Resources Res Center Bulletin 1, Univ New Hampshire, Mar 1967. 54 p, 25 fig, 7 illus, 7 tab, 16 ref, append

University of New Hampshire, Durham

DESCRIPTORS--/ costs/ water requirements/ economics/ *water costs/ *water supply systems/ water treatment/ water utilization/ replacement costs/ bibliographies/ investment/ cost analysis/ diseconomies of scale/ water distribution (applied)/ economies of scale/ water management (applied)/ watershed management/ prices/ *water rates
IDENTIFIERS--/ Piscataqua River Watershed

R202926 67A WATER QUALITY IN UPPER KLAMATH LAKE
This report defines the water quality in Upper Klamath Lake watershed during the period March 1965 to April 1966. It identifies the sources of algal nutrients and other constituents in water flowing into and out of Upper Klamath Lake and compares the quantity of these constituents in pristine streams, canals, rivers, agricultural drainage, and springs. Chemical analyses were made of algae, lake sediment, and bottom fauna samples. Algal species were identified and measured; during the period of the study Aphanizomenon flos-aquae represented about 90-99% of the total algal crop during the summer. Limiting nutrient studies using the isotope Carbon-14 to measure variations in primary productivity were conducted in situ and in the laboratory; data from these studies were difficult to interpret. Has 30 references.

R202926 67A

Miller, William E and Tash, Jerry C

INTERIM REPORT, UPPER KLAMATH LAKE STUDIES, OREGON

Federal Water Pollut Contr Admin Publication WP-20-8, Sept 1967. 37 p, 1 fig, 14 tab, 30 ref

Eutrophication Research Branch, Pacific Northwest Water Laboratory, Corvallis, Oreg

DESCRIPTORS--/ water quality/ water analysis/ impurities/ algae/ lakes/ sediments/ sampling/ aquatic life/ bibliographies/ phytoplankton/ *eutrophication/ *cyanophyta/ *aquatic algae/ Oregon/ benthic fauna/ bottom sediments

IDENTIFIERS--/ *algal nutrients/ Klamath Lake/ Upper Klamath Lake, Oreg/ water budget

R202929 67A OPTIMIZATION OF A WATER RESOURCES SYSTEM
For a deterministic hydrology, a model and optimization program are formulated to determine the monthly releases of water from a network of dams, rivers, and aqueducts which maximizes the joint output of the system from water and energy. The system model is nonlinear for the energy output from reservoir releases and the algorithm for optimization is a decomposition mathematical program, linear in the system constraints with dynamic programming used for the reservoir components where optimization is made over convex sets. The demand structures for firm water and energy permit secular changes with fixed monthly distribution of annual demand. A programming code is being tested which permits handling of 5 reservoirs for a 10-yr period.

R202929 67A

Parikh, Shailendra C, and Shephard, Ronald W

LINEAR DYNAMIC DECOMPOSITION PROGRAMMING APPROACH TO LONG-RANGE OPTIMIZATION OF NORTHERN CALIFORNIA WATER RESOURCES SYSTEM, PART I: DETERMINISTIC HYDROLOGY
Oper Res Center, Coll Eng, Univ California, Aug 1967. 65 p, 17 fig, 6 tab, 5 ref

University of California, Berkeley

DESCRIPTORS-- / *operations research/ optimum development plans/ water resources/ mathematical analysis/ hydrology/ reservoirs/ *mathematical models/ nonlinear systems/ *reservoir operation/ computer models/ linear programming/ computer programs/ dynamic programming/ *optimization

IDENTIFIERS--/ Central Valley, Calif/ deterministic model/ firm energy

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 1, NUMBER 8
AUGUST 1968

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Selected Water Resources Abstracts includes abstracts of current monographs, journal articles, translations, and reports. The contents of these documents cover the physical, life, and social science, as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water.

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SELECTED

WATER RESOURCES ABSTRACTS

VOLUME 1, NUMBER 8

AUGUST 1968

UNITED STATES DEPARTMENT OF THE INTERIOR

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R202934X68A JUST COMPENSATION IN CONDEMNATION CASES
A serious gap exists in Federal law concerning just compensation for private property taken by the Federal Government for public purposes. Under the present law, the landowner is at a serious disadvantage when negotiating with the Federal Government over the fair and reasonable value of his property. If the landowner wins a judgment exceeding the amount offered before or during the course of litigation, he is often the ultimate loser because his net return may be substantially less than the amount offered by the Government after deducting his attorney's fee, appraiser's fee, and fees of expert witnesses. Illustrations are cited of hardships suffered by many landowners. In an effort to remedy this situation, Senator Wayne Morse of Oregon introduced a bill providing that if, in a Government condemnation action determination is made that just compensation for the property condemned exceeds the maximum amount offered by the Government, any judgment entered in that action in favor of the Government shall provide payment to the defendant of an amount equal to the costs and expenses incurred by the defendant, in addition to the award for the value of the property.

R202934X68A

Morse, Wayne

JUST COMPENSATION IN FEDERAL CONDEMNATION CASES

Right of Way, Vol 15, No 2, pp 22-26, Apr 1968. 4 p

U S Senate, Washington, D C

DESCRIPTORS--/ *right-of-way/ *land ownership/ *land appraisal/ payment/ *compensation/ values/ losses/ negotiations/ damages/ *appraisals/ laws/ *real property

IDENTIFIERS--/ *condemnation/ *land acquisition/ *eminent domain/ Federal agencies

R202940 68A CANADIAN RESEARCH MANAGEMENT
The urgent needs confronting the Canadian research effort and the requirements of management for achieving progress are discussed. The rate of technical advances should correspond with the population growth, but the byproducts of industry place such strains on the social fabric of life that progress is seriously threatened. Government and education are the only hopes for directing modern technology toward benefiting the entire population. The Government must be prepared to give guidance in determining the main directions for the nation's research and development efforts. Education must inform people about science and sharpen the creativity, imagination, and intuition of scientists. Research specialists require exposure to the humanities and philosophy for an awareness of social needs, and knowledge of industrial, economic, and political demands. Management's functions include: (1) acquiring a balanced staff of scientists and engineers, (2) arranging the organizational structure to derive maximum output and input from each researcher, (3) motivating and obtaining the personal commitment of the staff to organizational goals, (4) attaining and fostering a creative climate, (5) providing leadership to retain research project continuity, and (6) having the good judgment to know when to cancel a project.

R202940 68A

Green, J J

THE MANAGEMENT OF RESEARCH

Eng J, Can, Vol 51/3, pp 15-20, Mar 1968. 6 p, 7 ref

Litton Systems Limited, Rexdale, Ontario, Canada

DESCRIPTORS--/ *research and development/ scientific personnel/ finance/ engineering personnel/ management/ administration/ creativity/ policy matters/ engineering education/ leadership/ education/ planning/ social values/ sociology/ *technology/ scientific organizations/ organizations/ values
IDENTIFIERS--/ foreign research/ Canada/ basic research/ research scientists/ applied research

R202947X68A PLANNING, PROGRAMMING & BUDGETING IN GOVT
Planning ahead is not a new concept. Government agencies and business organizations have always planned to some extent, but since World War II, significant changes have been made in the procedures used. Planning was originally an informal procedure, practiced more or less independently by a number of departments within an organization, to establish shortrun operating policies. Planning has since become a formalized, integrated process for establishing long-range objectives and translating them into quantitative terms, making assumptions about future conditions or events, weighing different courses of action and selecting the most suitable one, and using measures of effectiveness to evaluate results. Primary characteristics of a Planning, Programming and Budgeting (PPB) system are: (1) identification of fundamental objectives of a department with all activities related to these goals; (2) explicit identification of future year implications; (3) consideration of all pertinent costs; and (4) performance of systematic analyses to identify objectives, determine alternative ways of achieving them and estimate cost and expected results of each alternative. PPB is an instrument for generating conditions and pointing the way for intelligent and productive decision making.

R202947X68A

Murphy, Joseph S

PLANNING, PROGRAMMING & BUDGETING--THE QUIET REVOLUTION IN GOVERNMENT PLANNING TECHNIQUES

Manage Rev, Vol 57, No 4, pp 4-11, Apr 1968. 8 p, 1 tab

Office of Economic Opportunity, Washington D C

DESCRIPTORS-/ *planning/ *programs/ *budgets/ administration/ computers/ data processing systems/ policy matters/ decision making/ efficiencies/ reasoning/ control/ analysis/ operations/ coordination/ *scheduling/ costs/ management

IDENTIFIERS--/ *long-term planning/ procedures/ management planning/ PPB System/ ideas/ reports/ evaluation/ optimization/ Federal agencies

R202988X68A HOW TO SHARPEN LISTENING SKILLS
The technical professional, middle, or upper management level employee spends 45% of his workday listening. Improving listening skills increases his interpersonnel communications and general proficiency. Good listening enhances learning, thinking, problem solving, and decisionmaking, develops self-confidence, and is a help in selling. Awareness of listening deficiencies helps in mastering the art of good listening. Types of deficiencies that can be overcome are (1) lack of interest; (2) hasty evaluation or prejudgment; (3) greater concern for delivery than content; (4) emotionalism toward content, based on prejudice or previous conviction; (5) faked attention; (6) inability to concentrate; (7) failure to comprehend difficult material; (8) attention to distractions; (9) interest in individual facts instead of central ideas; (10) emotional deafness to loaded keywords, causing mental dissipation; (11) meticulous note-taking; (12) a know-it-all attitude; and (13) failure to adapt thought speed to speaker's speed. A good listening test and description of available listening lessons are given.

R202988X68A

Raudsepp, Eugene

HOW TO SHARPEN YOUR LISTENING SKILLS

Mach Design, Vol 40, No 11, pp 148-152, May 1968. 5 p, 1 photo

Princeton Creative Research Inc, N J

DESCRIPTORS-/ management/ training/ professional personnel/ decision making/ work/ efficiencies/ employee relations/ *communications/ behavior (psychology)/ reasoning/ *human behavior/ *concentration/ values/ analysis/ motivation/ disturbances/ learning

IDENTIFIERS--/ *listening/ ideas/ problem solving/ communication tools/ professional development/ *self-improvement

R202994 68A ATTRIBUTES OF A GOOD MANAGER

Every supervisor reflects his personal characteristics in the methods used to attain an efficient, high-morale department. But certain basic unchanging principles underlie the wide variety of individual touches a supervisor may put on his managerial style. A supervisor should use these principles flexibly to adjust his approach to his job, his department, and his personality. Some basic managerial principles used by a good supervisor include: (1) setting a good example; (2) encouraging cooperation; (3) building morale; (4) backing his people; (5) delegating; (6) treating each worker individually; (7) inspiring confidence; (8) not weakening under pressure; (9) understanding himself; and (10) being versatile, openminded, well organized, noncomplacent, patient, and concerned with the entire organization. Each of these managerial principles is discussed in the paper.

R202994 68A

Cribbin, James J

WHAT MAKES A GOOD MANAGER

Supervisory Manage, Vol 13, No 5, pp 2-6, May 1968. 5 p

St. John's University, Collegeville, Minn

DESCRIPTORS-- / *management/ *supervision/ *personnel management/ human behavior/ psychology/ employee relations/ *leadership/ coordination/ motivation/ responsibilites/ professional personnel

IDENTIFIERS-- / performance/ evaluation/ clarity/ recognition/ *morale/ *cooperation/ objectives

R203002X68A WRITING A STATE-OF-THE-ART REPORT

State-of-the-art reports are being used more frequently to summarize, evaluate, and disseminate current technological information and data. This type of report is defined as a comprehensive analysis of available knowledge (published and unpublished) on the status of a particular subject area and is frequently written for the use of a specific reader audience. These reports are often highly mission-oriented and may be part of a research and development program or a step in management decision-making. Scientists or engineers selected to generate such reports must be recognized authorities working in specific subject areas. State-of-the-art reports are a difficult form of technical writing. The writer must have adequate time to donate to the task; an organized team approach can frequently be helpful to him. Once a state-of-the-art report has been completed, followup of new advances in the area and updating of the report are facilitated. Detailed guidelines are given for preparing these reports.

R203002X68A

Darby, Ralph L and Veazie, Walter H

WRITING A STATE-OF-THE-ART REPORT

Mater Res Stand, Vol 8, No 5, pp 28-32, May 1968. 5 p, 1 fig, 2 tab, 5 ref

Columbus Laboratories of Battelle Memorial Institute, Ohio

DESCRIPTORS-- / *technical writing/ engineering personnel/ scientific personnel/ *reviews/ communications/ management/ information retrieval/ libraries/ research and development/ analysis/ abstracts/ methodology/ technical societies/ decision making/ coordination

IDENTIFIERS-- / information centers/ authors/ clarity/ *report writing/ goals/ writing/ technical papers/ cooperation

R202938 67A WORLDWIDE USE OF AIRPHOTOS IN AGRICULTURE

Use of aerial photographs in agriculture to provide data on agriculture production and to aid in inventory, planning, and development has increased throughout the world. This is especially true for larger countries where problems of obtaining data over wide areas are acute and for underdeveloped areas where time is a critical factor in initiating agricultural development. Trained scientists are using airphotos to conduct surveys and to train counterpart local personnel in countries where U N Special Fund projects exist. Several underdeveloped countries have expressed a need for regional training centers to instruct people in airphoto use in their working environments. In more developed countries, major use of airphotos will provide current information on land use and agricultural changes. A summary is given of airphoto use in several countries around the world. Has 26 references.

R202938 67A

Dill, Henry W Jr

WORLDWIDE USE OF AIRPHOTOS IN AGRICULTURE

U S Dep Agr Handbook 344, Sept 1967. 23 p, 7 fig, 2 tab, 26 ref

DESCRIPTORS--/ *aerial photography/ *agriculture/ planning/ mapping/ maps/ soil classifications/ photography/ soil conservation/ *data collection systems/ land development/ land utilization/ photographs/ vegetation/ water development/ bibliographies/ land classifications

IDENTIFIERS-- / surveys (data collection)/ soil maps/ cropping patterns/ remote sensing/ photointerpretation

R202989X68A HIGH-INTENSITY SOIL SURVEYS

High-intensity soil surveys are of greatest value for specific uses when made on aerial photographs at large scales. Cost-benefit ratios are greater than 1 to 100 and can be even greater for very expensive land development. This type of survey is custom made for 1 use in a given land area, is made upon special request, and is used immediately upon completion. The surveys assist in planning and constructing various facilities ranging from homes and industrial plants to cemeteries. Emphasis on interpretation of soil maps at large scales enables special legends to be devised for each development. Soil research can be performed concurrently with mapping to describe important soil characteristics. This article describes a special soil survey made for a dormitory complex and conference center at Cornell University, and illustrates how high-intensity soil surveys are contributing to orderly planning and development of expensive structures on relatively small areas of land. Has 15 references.

R202989X68A

Olson, Gerald W and Marshall, Raymond L

USING HIGH-INTENSITY SOIL SURVEYS FOR BIG DEVELOPMENT PROJECTS: A CORNELL EXPERIENCE

Soil Sci, Vol 105, No 4, pp 223-231, Apr 1968. 9 p, 4 fig, 2 tab, 15 ref

Cornell University, Ithaca, N Y; Soil Conservation Service, Syracuse, N Y

DESCRIPTORS--/ *soil surveys/ *aerial photography/ *land development/ *soil classifications/ soil horizons/ soil moisture/ *soil profiles/ soil science/ planning/ soil physical properties/ mapping/ lacustrine deposits/ land utilization/ land classifications/ benefit-cost ratios/ bibliographies

IDENTIFIERS-- / cost-benefit analysis/ *soil maps

R202964 67A ACCLIMATION OF FISH TO LOW OXYGEN
This study was undertaken to assess the extent of metabolic adaptation exhibited by fish exposed for relatively short periods of time to low levels of oxygen. Extensive research is being carried out concerning the effects of low oxygen on growth and survival of fish, but less is known of the capacity of fish to adapt metabolically to reduction in dissolved oxygen. Metabolic parameters investigated in the present study are metabolic rate of the whole animal, oxygen consumption of selected tissues, activity levels of certain respiratory enzymes, and levels of energy stores. Red blood cell counts were taken and measurements made of hemoglobin concentration and hematocrit (packed cell volume). Most of the study was done on the bluegill sunfish. A few experiments were performed with other centrarchid fishes; namely, white crappie, yellow perch, and pumpkinseed. The choice of bluegill sunfish as the main experimental animal was due to 2 factors: (1) ease of maintenance in the laboratory, and (2) the fact that this species, and many other centrarchids are exposed to periodic fluctuations in dissolved oxygen in their natural environment, and might be expected to possess mechanisms of physiological adaptation to oxygen stress.

R202964 67A

Pritchard, Austin W

ACCLIMATION OF FISH TO LOW OXYGEN: FINAL REPORT

Public Health Serv Rep, Washington, DC, 1967. 31 p, 8 tab, 4 fig, 7 ref

Oregon State University, Corvallis

DESCRIPTORS--/ *oxygen/ reduction/ *fish/ dissolved oxygen/ sunfishes/ fluctuation/ *respiration/ *metabolism/ yellow perch/ fish physiology/ aquatic environment/ environmental effects/ oxygen sag/ circulation (animals)/ *acclimatization/ oxygen requirements

IDENTIFIERS--

R202966 67A ECOLOGY OF CHIRONOMUS PLUMOSUS
The ecology and population dynamics of chronomus plumosus (L) were studied in 4 areas of Lake Winnebago for 3-1/2 yr to gain insight into the factors that cause fluctuations in populations of this insect and to indicate possible methods for biological or cultural control. This study was supported in part by a grant from Winnebago Lake Fly Research, Inc. and by the Public Health Service Grant WP00209.

R202966 67A

Hilsenhoff, William L

ECOLOGY AND POPULATION DYNAMICS OF CHIRONOMUS PLUMOSUS (DIPTERA: CHIRONOMIDAE) IN LAKE WINNEBAGO, WISCONSIN

Reprint, Ann Entomol Soc America, Vol 60, No 6, pp 1183-1194, Nov 1967. 12 p, 5 fig, 2 tab, 7 ref

University of Wisconsin, Madison

DESCRIPTORS-- / *ecology/ population/ fluctuation/ insect control/ aquatic environment/ *midges/ *diptera/ biocontrol/ cultural control/ aquatic microbiology/ entomology/ ecological distribution/ migration patterns/ aquatic habitats/ aquatic insects

IDENTIFIERS--/ aquatic ecology/ Lake Winnebago, Wisconsin

R202969 67A SALMON MIGRATION AND SPAWNING
From mid-August to mid-November of 1965, the Fisheries Research Institute conducted a study of the migration and distribution of the run of adult salmon in the Green-Duwamish River system. The objectives were: (1) to ascertain the timing and distribution of the run through the estuary and river, (2) to evaluate the effects of fluctuation in water quality in the bay and river on the timing and distribution of the run, (3) to measure the effects of natural environmental factors on the timing of migration through the river, and (4) to establish the distribution of natural spawners throughout the system. The program of field activities included tagging adult salmon, operating a fish counting station and surveying the natural spawning grounds. The great majority of the fish tagged were chinook salmon (Oncorhynchus tshawytscha), consequently most of the observations reported in this paper concern the run of chinook salmon. Federal Water Pollution Control Administration Grant WP00642-02.

R202969 67A

Miller, Denny M and Stauffer, Gary D

STUDY OF THE MIGRATION AND SPAWNING DISTRIBUTION OF THE RUNS OF CHINOOK AND COHO IN THE GREEN-DUWAMISH RIVER SYSTEM IN THE FALL OF 1965

Fisheries Res Inst, Univ Washington Circ 67-4, Apr 1967. 21 p, 10 fig, 3 tab, 6 ref

Public Health Service, Washington, D C

DESCRIPTORS-- / distribution/ ecology/ *fish/ *chinook salmon/ *spawning/ *migration/ *salmon/ marking

IDENTIFIERS--/ *coho salmon/ Green-Duwamish River, Wash

R202974 67A STUDY OF THE DUWAMISH ESTUARY
The objectives, techniques and some results of a study of the Duwamish River, Washington, are presented in this article. Objectives of the study are: (1) to develop a mathematical model to simulate the more important physical and chemical processes of the Duwamish estuary, including the rates of addition and dilution of pollutants, and (2) to investigate the ecology of pelagic and demersal fishes in the estuary and near-shore marine environments affected by industrial waste discharge. To help define the chemical and physical characteristics of the Duwamish estuary 2 empirical techniques, time series analysis and simulation programming, are employed. The tow net and a new mass-marking technique provide a means of quantifying information on the distribution, growth, abundance, and mortality of juvenile chinook salmon in estuarine waters. Simulation models may be used to estimate bias and to design sampling strategies that will reduce bias in survival estimates.

R202974 67A

Miller, Denny M; Wetherall, Jerry A; Lenarz, William H

A MODERN APPROACH TO THE STUDY OF ESTUARIES, WITH SPECIFIC REFERENCE TO THE DUWAMISH RIVER, WASHINGTON

Trans 32nd N Amer Wildlife Natur Resources Conf, Wildlife Manage Inst, Washington, DC, pp 165-173, Mar 1967. 9 p, 1 fig, 4 ref

University of Washington, Seattle

DESCRIPTORS-- / *ecology/ *estuaries/ simulation/ fish/ water pollution/ stream pollution/ *estuarine environment/ life history studies/ model studies/ mathematical models/ salmonids/ chinook salmon

IDENTIFIERS-- / *Duwamish River, Wash/ pelagic fishes/ demersal fishes

R202959 68A MASS TRANSFER IN AQUEOUS SOLUTIONS

One of the current problems in diffusional mass transport is that of formulating models for the multicomponent flux expressions in liquids. It is generally conceded that the inverted form of the so-called Stefan-Maxwell equations adequately describe diffusional phenomena in ideal gases. A corresponding analog has been suggested for liquids. Here, the model for liquids was based on assuming the Stefan-Maxwell analog, and then carrying out the necessary inversion by approximate methods. This model was tested by requiring that it describe diffusion, conductivity, and transport number data in aqueous solutions of several 1-1 electrolytes, over a concentration range of 0 to 1 normal. A steepest ascent numerical procedure was developed to extract a single set of optimum parameters from the experimental data. Using a single set of optimum parameters, including an optimum value for the water of hydration, an average deviation of about 2-3% was obtained between predicted and experimental results. Has 44 references.

R202959 68A

Wills, George B

MULTICOMPONENT MASS TRANSPORT IN AQUEOUS AND MEMBRANE SYSTEMS

Water Resources Res Center, Virginia Polytechnic Inst Bulletin 11, Jan 1968. 31 p, 5 fig, 4 tab, 44 ref, disc

Virginia Polytechnic Institute, Blacksburg

DESCRIPTORS-/ *mass transfer/ *diffusion/ osmosis/ electrodialysis/ bibliographies/ *membranes/ electrochemistry/ demineralization/ *ion transport/ liquids/ electrolytes/ *membrane processes/ desalination/ *aqueous solutions/ dialysis/ mathematical models

IDENTIFIERS--

R202965X67A AIR BUBBLES IN DILUTE AQUEOUS SOLUTIONS

The effects of small quantities of some organic compounds on the size of the air bubbles, the interfacial area, and the oxygen mass transfer coefficient were studied. The substances used were members of the homologous series of mono- and dicarboxylic acids and alcohols. Aloxite plate was used as the gas disperser. The results showed a profound effect of these compounds and a dependence of the effect on the length of the carbon chain of each member of the series. A possible explanation of this effect and its practical importance are discussed. This investigation was supported by Public Health Service (now Federal Water Pollution Control Administration) Grant WP-00562-01A1. Has 24 references.

R202965X67A

Zieminski, Stefan A; Caron, Maurice M; Blackmore, Robert B

BEHAVIOR OF AIR BUBBLES IN DILUTE AQUEOUS SOLUTIONS

I&EC Fundamentals, Vol 6, No 2, pp 233-242, May 1967. 10 p, 22 fig, 24 ref, disc

University of Maine, Orono

DESCRIPTORS-/ *bubbles/ *mass transfer/ *aeration/ measurement/ acids/ alcohols/ bibliographies/ *aqueous solutions/ air-water interfaces/ organic compounds

IDENTIFIERS-/ *air bubbles/ *mass transfer coefficient

R202935X68A IMPACT OF COMPUTERS ON SURVEYING METHODS
New procedures in field surveying have been developed to utilize the speed and power of the electronic computer. Computer usage reveals an important impact on surveying field methods and computation procedures. Problem-oriented computer programs have played an important part in this effect. The program provides flexible computer graphics capabilities enabling an engineer to use the computer as an aid in executing a survey beginning with the collection and use of record data to a completed map of the survey. This could include: (1) conversion of units of measurement, (2) a computer-plotted record map, (3) reduction of field data, (4) survey adjustments, (5) computations, and (6) a computer-plotted map of results of the survey. An example is given showing how 1 firm's entire survey operations have been influenced and aided by the electronic computer. MIT has developed the Integrated Civil Engineering System (ICES) for 3rd-generation computer systems. This system integrates all facets of a project from planning through design and contruction.

R202935X68A

Montgomery, Clarence J

IMPACT OF COMPUTERS ON SURVEYING METHODS

Proc Amer Soc Civil Eng, J Surveying Mapping Div, Vol 94, No SU1, pp 25-36, Jan 1968. 12 p, 8 fig, 2 tab, 3 ref

Getty Oil Company, Houston, Tex

DESCRIPTORS--/ *surveying/ *computers/ programs/ data collection systems/ *data processing systems/ data reduction/ topographic surveys/ planning/ civil engineering/ topographic mapping/ *computer programming

IDENTIFIERS--/ computer capability/ problem-oriented languages/ ICES

R202945X68A BRIDGE ANALYSIS--ORTHOTROPIC PLATE THEORY
Two analytical methods are presented for use in bridge analysis. The inclusion of the orthotropic plate theory permits consideration of any type of deck configuration. Structural continuity between all supporting members and their flexibilities may be considered. Computer programs have been developed to apply these techniques. One method, slope deflections, uses the IBM 1620; the other technique, finite differences, uses the IBM 7094. All of the developed equations have been applied to problems consisting of isotropic plates. Complete agreement from both methods and previously analyzed structures occurred for these test cases. An example orthotropic bridge structure was initially designed and then analyzed, when subjected to a truck loading. The resulting deflection and moment data throughout the structure were obtained by both analytical methods. These data are compared, resulting in excellent agreement between methods.

R202945X68A

Heins, Conrad P Jr and Looney, Charles T G

BRIDGE ANALYSIS USING ORTHOTROPIC PLATE THEORY

Proc Amer Soc Civil Eng, J Struct Div, Vol 94, No ST2, pp 565-592, Feb 1968. 28 p, 24 fig, 12 ref, append

University of Maryland, College Park

DESCRIPTORS--/ *bridge design/ *bridges/ analysis/ computer programming/ *structural analysis/ structural behavior/ *elasticity/ plates/ torque/ elastic deformation/ finite differences/ Fourier analysis/ deflection/ plate girders/ structural engineering/ moments/ beams/ loads

IDENTIFIERS-- / finite difference method/ comparative studies/ bridge decks/ *orthotropic bridges/ slope deflection method

R202990 68A BURIED ASPHALT MEMBRANE CANAL LINING

Analysis of test results and visual observations on membrane samples after 14 yr service revealed no serious deficiencies in asphalt membrane lining. Of the 112 samples evaluated from 20 different canal installations, more than 80% demonstrated satisfactory resistance to field aging. Membranes in poor condition resulted from accelerated aging primarily due to defective construction practices. Test results indicated that thickness is one of the more important factors contributing to life of the asphalt membrane. A minimum thickness of 0.20 in., approximately 1.25 gal/sq yd, is required for longtime service. For a majority of the membranes evaluated, the change in physical properties due to field aging did not materially affect the ability to provide a flexible, watertight lining. Tests indicated that the greatest portion of this change occurs during the first 6 yr; after this period the rate of change decreases. An aging index was calculated through a computer program to determine the relative change in physical properties of the membrane. This study reaffirms that adequate seepage control will be maintained for many years if the membrane is installed according to current Bureau of Reclamation specifications.

R202990 68A

Geier, Fred H and Morrison, William R

BURIED ASPHALT MEMBRANE CANAL LINING

Water Resources Tech Publication, Res Rep 12, 1968. 49 p, 35 fig, 21 tab, 8 ref, 4 append

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ laboratory tests/ asphalt/ asphalt cement/ bituminous materials/ *buried membranes/ *canal linings/ ductility/ flexible linings/ *impervious linings/ impervious membranes/ *lower cost canal linings/ materials testing/ seepage losses/ spraying/ field tests/ ponding tests/ weathering/ computer programming/ aging
IDENTIFIERS--/ *catalytically blown asphalt/ FORTRAN/ *asphalt membranes

R203000 66A CONCRETE FOR KRASNOIARSK DAM

Quality control field testing of aggregate, cement, and concrete at Krasnoiarsk Dam, USSR, indicated as of September 1964, that: (1) washed sands and gravel met specifications, except for larger fractions where a second sorting at the concrete plant was recommended; (2) cement was satisfactory regarding mineral composition, heat generation, and strength; (3) concrete control specimens and cores drilled from mass concrete of the dam were within specification limits for strength and water permeability; and (4) temperature control for concrete at time of placement was not acceptable for summertime. However, since the first mass concrete placement (1961), many problems were faced and changes made in procedures, equipment, and organization in the aggregate processing plants, the Krasnoiarsk Cement Plant, and the 2 mixing plants. A fully automated continuous-flow concrete mixing plant is used for portland cement and slag-portland cement concretes, and a 3-section batching plant is used for special types or batches of concrete. Problems concerning automated equipment, temperature control, supply, and construction site organization are discussed. Figures show layout for continuous-flow mix plant, zoning of dam for types of concretes, cement chemical composition, and test results.

R203000 66A

Ginzburg, Ts G; Zinchenko, N A; Skvortsova G F

CONCRETE FOR KRASNOIARSK DAM

Gidrotekh Stroit, No 2, pp 6-12, 1966. Transl from Russ, Bur Reclam Transl 676, Oct 1966, 35 p, 12 fig, 5 tab

DESCRIPTORS--/ *mass concrete/ *concrete technology/ batching/ slags/ concrete control/ concrete mixes/ *concrete plants/ concrete placing/ *concrete dams/ aggregates/ gradation/ conveyors/ automatic/ quality control/ portland cement/ permeability/ concrete testing/ cold weather operations
IDENTIFIERS--/ USSR/ frost resistance/ Krasnoiarsk Dam, USSR/ crack control/ slag cement

CONSTRUCTION

R202998 68A TUNNELING WITH CAVITATION FROM WATER JETS
Enormous destructive forces produced by cavitation in flowing liquids under optimum conditions have been a great problem to designers of hydrodynamic systems. These destructive forces can be utilized to drill effectively through rock at rates increased to meet modern requirements in tunneling and mining operations. In a test facility capable of producing cavitating jets at 500-fps velocity, intensities of 300 W/M squared have been produced. Erosion strength of some typical rocks has been determined and the best configuration that produces maximum intensity of erosion is indicated. Erosive power of the jet is directly proportional to the power of the jet. Effects of other parameters are presented including exposure time and distance between the nozzle and eroded piece. Much of the success of the method depends upon the nozzle inserts producing cavitation. Two configurations of inserts show promise; 1 is a straight pin acting as a blunt body producing a cavity at its trailing wake, and the other is a turning vane that produces a vortex cavity at the core of the jet. Although the findings are encouraging, further engineering studies are required to optimize the design parameters.

R202998 68A

Johnson, V E Jr; Thiruvengadam, A; Kohl, R E

ROCK TUNNELING WITH HIGH-SPEED WATER JETS UTILIZING CAVITATION DAMAGE

Amer Soc Mech Eng Publication 68-FE-42, 1968. 6 p, 12 fig, 1 tab, 13 ref

Hydronautics, Inc, Laurel, Md

DESCRIPTORS-/ *tunneling/ tunneling machines/ tunnels/ laboratory tests/ tunnel construction/ *cavitation/ *rock excavation/ erosion/ compressive strength/ *jets/ mining/ test procedures/ *nozzles/ rocks/ drilling

IDENTIFIERS-/ cavitation control/ *cavitation machine/ *jet piercing

DAMS AND HYDRAULIC STRUCTURES

R202958 68A STRUCTURAL BEHAVIOR OF TUNNEL LINERS
Strain and pressure meters were installed on tunnel liners near the portals of 2 pressure tunnels during construction of the Spring Creek power conduit. Purpose of the installation was to obtain structural behavior measurements for information on the amount of total static head resisted by steel liners. Three strain meters and 2 pressure meters were installed at 6 tunnel stations. Installation of these meters and interpretation of test results are discussed. Measurements were made over a 5-year period. Results indicated one-fifth of the total head was resisted by the liners and permanent stress changes were not produced in the liners from backfill grouting. Exterior surfaces of some liners were subjected to hydrostatic pressures produced by ground water or by water leaking from the conduit. Measurements taken after placing backfill concrete showed that compressive stresses developed in the liner before the conduit was filled. Additional measurements will be required before an explanation can be given for the conditions producing initial compressive stresses in the liner.

R202958 68A

Rouse, George C

STRUCTURAL BEHAVIOR MEASUREMENTS OF TUNNEL LINERS, SPRING CREEK POWER CONDUIT

Bur Reclam Dams Br Rep No DD-6, Jan 1968. 44 p, 18 fig, 1 photo, 1 tab, 4 ref

Bureau of Reclamation, Denver, Colorado

DESCRIPTORS-/ *structural behavior/ *tunnel linings/ tunnels/ hydrostatic pressures/ *pressure conduits/ *penstocks/ strain gages/ pressure gages/ pressure measuring equip/ strain measurement/ *pressure tunnels/ stress/ instrumentation/ field tests/ steel linings/ *tunnel pressures/ tunnel design
IDENTIFIERS-/ Spring Crk Powerplant Calif/ Carlson strain meter/ tunnel supports

R202984 68A UPPER RESERVOIR--SENECA PUMPED-STORAGE
The 380-mw Seneca Pumped-Storage Plant is under construction in northwestern Pa as part of the Kinzua Project. This facility is being installed adjacent to the Kinzua Dam, a Corps of Engineers' project, on the Allegheny River 200 miles upstream from Pittsburgh. The upper reservoir is 800 ft above the river, will have live storage of 6,400 ac ft, and will be lined fully with asphaltic concrete. Detail geology is given and reservoir designs and lining considerations are reviewed. Information gained during reservoir construction lead to several major design changes. A review is given of European experiences in using asphaltic concrete for impervious linings. European plants visited during study included Geesthacht on the Elbe River near Hamburg, Germany; Erzhausen on the Leine River near Hannover, Germany; and Vianden on the Our River on the German-Luxembourg border.

R202984 68A

Jones, J C and Kleiner, D E

THE UPPER RESERVOIR FOR THE SENECA PUMPED-STORAGE PLANT

Pap, Conf Recent Develop Design Constr Earth Rockfill Dams, Univ California, Berkeley, March 1968. 34 p, 12 fig, 1 tab, append

Harza Engineering Co, Chicago, Ill

DESCRIPTORS-- / *pumped storage/ electric power production/ *reservoirs/ geology/ design/ *impervious linings/ asphaltic concrete/ construction/ foreign construction/ silty loams/ foundations/ economics/ dikes/ earth dams/ instrumentation

IDENTIFIERS-- / Pennsylvania/ Kinzua Project, Pa/ Germany/ Vianden Pumped-Storage Proj/ Geesthacht Power Station/ Erzhausen Plant, Germany

R202985 68A MEASURING PERFORMANCE OF DAMS
This paper reviews various methods used to interpret data obtained from instrumentation of an embankment. A case history, El Infiernillo Dam, Mexico, is presented showing how various methods of interpretation provided some insight into the significant influence of load transfer on behavior of a major dam. Emphasis is placed on data obtained from instruments that measure movements or displacements, such as surface reference monuments, crossarms, and inclinometers. Surface reference monuments are installed primarily to measure settlement; however, longitudinal strains can be calculated if the change in distance between any 2 monuments in the same line is measured. Measurement of movement of a monument in more than 1 direction allows vectors of movement to be drawn. Conclusions that may be drawn from studies of various types of measurements are discussed. The load transfer concept and its occurrence and effect on the El Infiernillo Dam are discussed.

R202985 68A

Squier, L Radley

INSTRUMENTATION AND MEASUREMENTS OF PERFORMANCE OF DAMS

Pap, Conf Recent Develop Design Constr Earth Rockfill Dams, Univ California, Berkeley, Mar 1968. 33 p, 17 fig, 4 ref

Shannon and Wilson, Inc, Portland, Oreg

DESCRIPTORS--/ *earth dams/ *embankments/ movements/ *instrumentation/ deflection/ settlement/ dams/ inclinometers/ strain/ rockfill dams/ consolidation/ shear stress/ pore pressures/ field tests

IDENTIFIERS-- / *El Infiernillo Dam, Mexico

DAMS AND HYDRAULIC STRUCTURES

R202986 68A CONDUITS AND STRUCTURES AT DAMS

Appurtenant conduits and structures such as outlet works and spillways constituted 50% of the defects disclosed by California's 5-yr surveillance program of water storage facilities. This paper discusses the remedial work to correct these defects and recommends some precautionary measures to avoid such defects. The 1963 Baldwin Hills disaster demonstrated that a possible hazard is created by placing rigid structures on yielding foundations. Some method for accommodating movement should be provided where conduits cross faults, shear zones, or yielding foundations. One way to accomplish this for a buried pipe is to leave an annular air space between the pipe and its encasement. Another potential trouble source is placing a conduit on a combined fill and rock foundation. Cutoff collars are used occasionally around conduits to prevent piping, but their use warrants careful attention. Techniques used in constructing conduits are examined, and some of the more common materials used are listed and discussed. Problems at reservoir appurtenant facilities can be prevented or solved by using the simple principles discussed in this paper.

R202986 68A

Jansen, Robert B

CONDUITS AND STRUCTURES AT DAMS

Pap, Conf Recent Develop Design Constr Earth Rockfill Dams, Univ California, Berkeley, Mar 1968. 15 p

California State Department of Water Resources, Sacramento

DESCRIPTORS--/ *conduits/ *earth dams/ *outlet works/ outlets/ collars/ *hydraulic conduits/ hydraulic structures/ *spillways/ foundations/ dam failures/ shear planes/ faults (geology)/ embankments/ cutoffs/ seepage/ underdrains/ safety/ pipes/ *differential displacements/ dams/ differential settlement/ tunneling/ dam foundations
IDENTIFIERS--/ California Dept Water Res/ dam stability

DEMINERALIZATION

R202970 67A REVERSE OSMOSIS DESALINATION

The object of the present work is to present an analysis of the performance of a tubular reverse osmosis duct without the unrealistic assumption of constant water flux and taking into account the case of the developing velocity profile. A mathematical analysis, based on boundary layer theory, is presented for the case of a tubular reverse osmosis duct whose walls are made of a semipermeable membrane. The analysis considers the simultaneous development of velocity and concentration profiles. The momentum and diffusion equations, coupled through both the boundary conditions and the conventive terms in the diffusion equation, are solved by the integral method which also takes into account the nonlinear effects created by the varying water flux produced. Typical results are presented for the concentration buildup at the membrane wall, the flux of water produced and the productive capacity of the system. Since the concentration profile at any value of Z is given as a simple polynomial, the results can be used to study the relaxation of concentration polarization as a Graetz type of problem. Federal Water Pollution Control Administration Grant WP-00968-01A1.

R202970 67A

Srinivasan, S and Tien, Chi

REVERSE OSMOSIS DESALINATION IN TUBULAR MEMBRANE DUCT

Pap, Second Europe Symp Fresh Water From Sea, Athens, Greece, May 1967. 24 p, 6 fig, 2 tab, 10 ref, disc

Syracuse University, N Y

DESCRIPTORS--/ laminar flow/ mathematical analysis/ *demineralization/ membranes/ *reverse osmosis/ *semipermeable membranes/ boundary layers/ *analytical techniques

IDENTIFIERS--/ *tubular reverse osmosis duct/ velocity profiles/ *tubular membrane duct

R202936X68A AQUIFER CHARACTERISTICS AND WELL FLOW
Ground water is the second largest source of fresh water, and increased extraction has resulted in overdrafts in many parts of the world. Accurate knowledge of storage coefficients and hydraulic conductivities is imperative for planning projects involving the underground flow of water. Procedures are presented to determine these coefficients by measuring the discharge from a single well under constant drawdown pumping conditions without recourse to an observation well. Derivation and solution of the basic differential equation of flow in an unconfined aquifer, initial and boundary conditions, and calculation of the average rate and the accumulative volume of flow from a pumped well are explained. Numerographical solutions are developed for determining unconfined aquifer characteristics and unsteady flow through injection wells under constant drawdown or injection pressure conditions. Has 25 references.

R202936X68A

Esmaili, Houshang and Scott, Verne H

UNCONFINED AQUIFER CHARACTERISTICS AND WELL FLOW

Proc Amer Soc Civil Eng, J Irrig Drainage Div, Vol 94, No IR1, pp 115-136, Mar 1968. 22 p, 6 fig, 3 tab, 25 ref, 2 append

Engineering-Science, Inc, Oakland, Calif; University of California, Davis

DESCRIPTORS--/ *aquifers/ *ground water/ *groundwater recharge/ *wells/ hydraulic conductivity/ recharge wells/ bibliographies/ unsteady flow/ characteristics/ permeability/ drawdown/ injection/ underground water storage

IDENTIFIERS-- / *injection wells/ *artificial recharge/ *artificial replenishment/ cone of depression/ storage coefficients

R202956 68A AQUIFER SWEETENING
Aquifer sweetening was studied using a rectangular, glass-walled, sand-filled tank. Two types of aquifers were studied: (1) a 1:40 scale, two-part aquifer (coarse and fine sand) representing a vertical cross section through an idealized portion of an irrigated valley; and (2) a fine sand, single-part aquifer used to evaluate a formula derived from the Ghyben-Herzberg principle for computing depth to a saline-fresh water interface. Salt water was flushed from the aquifers into subsurface drains by applying fresh water to the surface. Test results for both aquifer types showed that tile drains placed near the ground surface will not intercept and discharge surface-applied fresh water if all or part of the aquifer contains salt water. The fresh water displaces the salt water without appreciable mixing and moves it into the drains forming a stable fresh water-salt water interface. Reducing the spacing of drains reduces the amount of salt water that will be removed from the aquifer. The aquifers were charged with salt water having sodium chloride concentrations of 4,000 to 79,770 ppm and colored blue for visual identification. Progress of the tests was recorded in still- and timed-sequence motion pictures.

R202956 68A

Carlson, Enos J

REMOVAL OF SALINE WATER FROM AQUIFERS

Bur Reclam Res Rep No 13, 1968. 42 p, 49 fig, 2 tab, 11 ref

Bureau of Reclamation, Denver, Colorado

DESCRIPTORS--/ *hydraulic models/ model tests/ drainage/ groundwater flow/ water table/ fresh water/ permeability/ saline water/ fluid flow/ dyes/ tracers/ *ground water/ hydrostatic pressures/ flow nets/ *subsurface drains/ tile drains/ *aquifers

IDENTIFIERS-/ two-part aquifers/ single-part aquifers/ flow rate/ saline ground water/ Ghyben-Herzberg principle/ saline-nonsaline interfaces

R202961 68A DISPERSION OF CONTAMINANT IN GROUND WATER
The coefficient of transverse dispersion has been determined experimentally with the Reynolds number between 0.3 and 380. It is found that inertial forces are important and the flow pattern of the contaminant varies with the Reynolds number even in a flow obeying Darcy's law. Empirical formulas for the coefficient of dispersion are suggested. Solutions have been obtained for dispersion of contaminant for a line source and from a point source in a nonuniform flow of ground water. Variations of soil properties and velocity along the flow modify the maximum concentration at each cross section, while transverse variation of velocity causes a lateral shift of the trail of contaminant, and destroys the symmetry of concentration distribution at a cross section. Contamination of a well by dispersion is used as an example of application. Effects of gravity and differences in density and viscosity on dispersion at the interface of 2 miscible fluids have been studied and these effects are usually negligible. This conclusion has been verified experimentally. Solutions have been obtained for dispersion at the interface of 2 fluids in 2-dimensional flow. These solutions are found to be valid for dispersion at the interface of 2 fluids in 3-dimensional flow. Has 18 references.

R202961 68A

Li, Wen-Hsiung

TRANSVERSE DISPERSION OF CONTAMINANT IN GROUND WATER: FINAL REPORT

Department Civil Eng, Syracuse Univ, Jan 1968. 53 p, 20 fig, 18 ref, append

Syracuse University, N Y

DESCRIPTORS--/ permeability/ *dispersion/ flow/ hydraulics/ *diffusion/ *ground water/ *wastes/ Reynolds number/ velocity/ soil physical properties/ testing/ porous media/ soil properties/ Darcys law/ interfaces/ bibliographies

IDENTIFIERS-/ flow patterns

R202997 67A OPTIMUM DEPTH FOR DRAINAGE TILE IN CLAYS
Principal factors determining the selection of drainage line depth are: (1) the filtering capacity of soils, (2) the depth of soil freezing and course of thawing, (3) purpose for reclaiming the land, (4) the critical calculated period for removing ground waters. This paper examines the necessary depth for drains in clayey loam and clayey soil. The filtering capacity of soils being drained fluctuates substantially in time and space, with the least amplitude in fluctuation being observed for sandy soils, and the greatest for clayey loam and clayey soil. Clayey soils have a high shrinkage factor and upon drying exhibit a branching network of large and small cracks. In this state these soils are more water-penetrable than sandy loams. With excessive moistening, clayey soils swell, the cracks close gradually, and water permeability decreases greatly. The depth for placing a drain under ground water conditions must be established in each case, taking into consideration the stratification and location of ground water flow. Deepening the drainage systems will result in deepening the open collectors and increasing the cost.

R202997 67A

Krivonosov, I M

DRAINAGE LINE DEPTH

Gidrotekhnika i Melioratsiia, Vol 18, No 6, pp 44-51, 1966. Transl from Russ, Joint Publications Res Serv Transl 685, Oct 1967. 11 p, 5 fig, 1 tab, 11 ref

DESCRIPTORS--/ *drainage systems/ drain tiles/ drainage costs/ *ground water/ tile drains/ *clays/ expansive soils/ frozen soils/ impervious soils/ pervious soils/ percolation/ deep percolation/ permeability/ ice/ capillarity/ field tests/ land reclamation/ swamps/ freezing/ drainage
IDENTIFIERS-- / USSR/ foreign research/ *drains/ root systems

R202951X68A HARMONIC OVERVOLTAGES ON LARGE GENERATORS

Overvoltages, caused from harmonics generated during unbalanced faults on transmission lines charged by hydromachines, were studied with digital techniques. Results apply to Grand Coulee Third Powerplant for 615-mva generators and 500-kv lines, but are of a general nature. Influences of generator rotor losses, saturation and related parameters, transformer and line impedances, and fault phase angles were investigated. Harmonic overvoltage is primarily a function of the generator saliency ratio and line impedances. Generator saturation and losses reduce overvoltages, but saturation may increase overvoltages of generators with intercooling and large amortisseurs. To keep overvoltages within 1.5 and 2.5 per unit, the generator should have normal saturation, a saliency ratio between 1.15 and 1.35, and system design should prevent harmonic resonant line lengths. However, resonance approached through overspeed of load rejection is not serious. A simplified flow chart is given for the harmonic overvoltage digital program.

R202951X68A

Fillenberg, R R; Gish, W B; Chen, Mo-Shing; et al

HARMONIC OVERVOLTAGES ON LARGE SYNCHRONOUS MACHINES

Pap, 20th Annu SWestern Inst Elec Electron Eng Conf Exhib, Houston, Tex, Apr 1968. 9 p, 14 fig, 1 tab, 8 ref, 2 append

Bureau of Reclamation, Denver, Colo; University of Texas, Arlington

DESCRIPTORS--/ *electric generators/ transmission lines/ electric power/ losses/ *faults (electrical)/ digital computers/ circuits/ excitation/ extra high voltage/ computer programming/ electric currents/ alternating currents/ power system operations/ saturation/ hydroelectric power/ transmission (electrical)
IDENTIFIERS--/ *harmonics/ *overvoltage/ *synchronous machines/ impedance/ load rejection/ reactance

R202952X68A EVALUATING EXCESS CAPACITY IN SUBSTATIONS

A common method of improving reliability of a power system substation is the installation of multiple transformer banks acting in parellel to carry the load. Transformer capacities are usually chosen so that one bank can be lost at time of substation peak load without loading remaining banks in excess of their emergency ratings. Such a method of minimizing consumer interruption caused by failure of a single transformer bank is effective but expensive, since more capacity must be installed in the substation than is normally required to carry the load. Two alternatives exist offering prospects for reducing substation capacity and cost, with a small loss in substation reliability. The first is to reduce redundant or spare capacity to an amount less than that required to protect against loss of one transformer at time of peak load. The second involves replacing some of the redundant capacity in a group of substations with capacity in a mobile substation. An analytical method is presented for evaluating service reliability provided by substations with less than full redundancy (firm capacity).

R202952X68A

Patton, A D

A METHOD FOR EVALUATING REDUNDANT CAPACITY IN SUBSTATIONS

Pap, 20th Annu SWestern Inst Elec Electron Eng Conf Exhib, Houston, Tex, Apr 1968. 6 p, 3 fig, 2 tab, 3 ref

Texas A&M University, College Station

DESCRIPTORS--/ *substations (electrical)/ power transformers/ peak loads/ costs/ capacity reduction/ *reliability/ power system operations/ faults (electrical)/ overloads/ failure (power)/ probability/ electric power/ economies/ electrical equipment

IDENTIFIERS--/ outages/ *installed capacity/ mobile substations

R202953X68A TRENDS IN EHV TRANSMISSION DESIGN

Transmission engineering and system planning today involve more choices and greater challenges in the development of electric power transmission than at any other period. Availability of higher voltage transmission equipment has increased economical potentials of larger size generating units and extended the horizons of interconnection and regional integration. Reviewing cost comparisons based on trends and experience in design for a variety of conditions can be useful in preliminary consideration for planning of proposed systems. Such comparisons are not readily determined from reviewing the many reports concerning designs applied to particular situations and conditions. This paper reviews trends and makes comparisons to assist in perspective and may oversimplify, rather than explore in depth, the many problems to be studied for future expansion. Developing trends in insulation and clearance requirements and cost comparisons are given for 4 different extra high voltage ratings of transmission line design.

R202953X68A

Sanford, Frank E

TRENDS AND COMPARISONS IN EHV TRANSMISSION DESIGN

Pap, 20th Annu SWestern Inst Elec Electron Eng Conf Exhib, Houston, Tex, Apr 1968. 7 p, 5 fig, 3 tab

Commonwealth Associates, Inc, Jackson, Mich

DESCRIPTORS--/ *extra high voltage/ transmission lines/ systems analysis/ design/ clearances/ *cost comparisons/ electric power/ bus (electrical)/ substations (electrical)/ electrical equipment/ electric insulation/ *transmission (electrical)/ costs/ planning/ right-of-way/ aesthetics

IDENTIFIERS--/ *electrical design/ *interconnected systems/ investment/ interties/ electric conductors

R202993X67A ECONOMICS AND RELIABILITY OF BULK POWER

The 1965 power failure in Northeastern United States caused a sudden realization of the nation's nearly complete dependence upon electric power and of the value of an uninterrupted supply. The Federal Power Commission has recommended steps to improve the reliability of bulk power supply in the northeast and throughout the United States. These goals can be achieved by 1975 through a concerted effort. Time is needed to strengthen regional transmission networks and interconnections between regions to prevent separation or isolation by major disturbances. Bulk power failures start from human errors, equipment failures, violent storms, or actions of animals. The foundation of reliability is an adequate transmission system. Networks must have a large reserve capability to serve many potential requirements, including some that are unforeseen. Costs of installing improved communications, better system controls, load shedding relays, and emergency power for safe rundown and rapid startup of generation are not insignificant and may amount to millions of dollars. Economic and other benefits resulting from improved reliability are discussed.

R202993X67A

Brown, F Stewart

ECONOMICS OF RELIABILITY OF BULK POWER SUPPLY IN THE UNITED STATES

Inst Elec Eng Conf Publication 34, Part 1 Contrib, pp 150-154, Oct 1967. 5 p

Federal Power Commission, Washington D C

DESCRIPTORS--/ *electric power failures/ electric power/ *disturbances/ transmission (electrical)/ errors/ costs/ control systems/ electric power production/ *reliability/ electrical equipment/ storms/ values/ electrical stability/ economics/ benefits/ losses/ electrical networks

IDENTIFIERS-- / Federal Power Commission/ *load shedding/ recommendations/ *interconnected systems/ interties/ electric utilities/ *outages

R203004 67A OVERVOLTAGES AND FAULTS ON TUNED LINES

A transmission line with a half-wave characteristic tuned to the frequency of the power supply, develops direct resonance characteristics leading to exceptionally high overvoltages under short-circuit conditions with linear electrical transmission parameters. This theory is correct only for balanced faults when the fault condition is determined entirely by parameters of the load sequence. Unbalanced faults in normal electrical transmission are distinguished by a large variety of characteristics depending on the type of fault, the faulted conditions, and the parameters of individual sequences, especially neutral sequences. Overvoltages resulting from unbalanced faults are studied. Use of inductive reactance grounding for transformer neutrals and their favorable effect on transmission line overvoltages are discussed. Preliminary data indicate that putting reactive elements into electrical transmission equipment neutrals is most effective for limiting overvoltages by increasing the active component of line impedance of the neutral sequence circuit.

R203004 67A

Ol'shevskii, O V and Samorodov, G I

LIMITATION OF OVERVOLTAGES IN TUNED ELECTRICAL TRANSMISSION LINES WITH SINGLE-PHASE SHORT-CIRCUITS

Izvestiia Sibirskogo Otdel Akadem Nauk SSSR, No 6, pp 9-15, 1964. Transl from Russ, Joint Publications Res Serv Transl 695, Aug 1967, 8 p, 6 fig, 3 ref

DESCRIPTORS-/ *transmission (electrical)/ transmission lines/ power transformers/ *faults (electrical)/ electrical impedance/ resistors/ capacitors/ electric power/ electric potential/ alternating currents/ *resonance/ circuits/ electric currents/ mathematical analysis

IDENTIFIERS-- / *tuned transmission/ *overvoltage/ USSR/ reactance/ foreign research

R202942X68A ESTIMATING ROCK POROSITY FOR GROUTING

The amount of grout injected into a fractured foundation rock depends upon fracture porosity and spacing and sizes of fracture openings. These properties cannot be measured directly, but may be calculated from borehole water-pressure tests if several simplifying assumptions are made. The method is valid for fractured rock masses of very small intergranular permeability (as compared to fracture permeability) containing no solution cavities or pervious interbeds. Studies of 35 damsites indicated maximum fracture porosities were 0.05% near the surface, decreasing to 0.005% at the 200-ft depth. The volume of grout required for impregnation was correspondingly small. Fracture openings decreased from 100 microns to 50 microns in the same depth interval. Cement grout was limited to the largest fractures. The minimum spacing of open fractures increased from 4 to 14 ft. All rock types appeared similar in fracture properties. Has 24 references.

R202942X68A

Snow, David T

ROCK FRACTURE SPACINGS, OPENINGS, AND POROSITIES

Proc Amer Soc Civil Eng, J Soil Mech Found Div, Vol 94, No SM1, pp 73-91, Jan 1968. 19 p, 7 fig, 2 tab, 24 ref

Colorado School of Mines, Golden

DESCRIPTORS-/ *foundation investigations/ foundations/ *grouting/ rocks/ fractures/ permeability/ porosity/ engineering geology/ boreholes/ *dam foundations/ *rock foundations/ geologic investigations/ drill holes/ cement grouts

IDENTIFIERS-- / rock joints/ grout take/ spacing/ jointed rock/ openings/ geologic defects

R202943X68A FOUNDATIONS UNDER DIFFERENTIAL SETTLING

A method is presented for foundation design using extrema envelopes of moments, shear forces, reactions, and angular distortions derived by computer calculation of all essential load states and soil properties scatter alternatives. The approach is based on realization that subgrade conditions can never be known in enough detail to justify a calculation based on a single assumption regarding soil properties. Therefore, many probable combinations of subgrade properties scatter and load states should be considered. The method is illustrated on a 4-span beam on single footings, but is applicable to other systems. The procedure consists of: (1) designing footings for uniform maximum allowable settlement under real load; (2) determining load matrices for 16 essential states; (3) determining footing-stiffness matrices for 32 alternate soil modulus extrema under footings; and (4) selecting extrema to be used for drawing envelopes from the total (32 x 16 equal 512) resulting matrices. The computer-based method permits judicious decisionmaking by checking several footing alternatives (for different allowable settlements) with several structural rigidities. Two numerical examples are provided.

R202943X68A

Getzler, Zvi

DESIGN OF FOUNDATIONS UNDER DIFFERENTIAL SETTLING

Proc Amer Soc Civil Eng, J Struct Div, Vol 94, No ST1, pp 53-70, Jan 1968. 18 p, 3 fig, 3 tab, 7 ref, append

Israel Institute of Technology, Haifa

DESCRIPTORS-- / *foundations/ design tools/ design/ beams/ footings/ shear forces/ *differential settlement/ probability/ *settlement/ *structural design/ structural engineering/ soil physical properties/ distortion (structural)/ subgrade/ moments/ bearing capacities/ computer programming
IDENTIFIERS-- / foundation modulus/ soil-structure interaction/ subgrade modulus/ matrix methods (structural)

R202950X68A CHEMICAL GROUTS

The high unit cost of chemical grouts, as compared with clays and cements, requires a different engineering approach for field use. Techniques have been developed to minimize waste and maximize accuracy of placing the grout at desired locations. These procedures are often opposite to those used with cement grouts. Experienced cement grouters have had difficulty in assimilating the required techniques for using the newer chemical grouts; e.g., the gel time is shorter than the pumping time. Acceptance has increased of all procedures pertinent to chemical grouting as field experience has expanded, and the mechanism of gel formation times studied. A rapidly growing core of knowledge is forming the basis for a new chemical grouting technology.

R202950X63A

Karol, Reuben H

CHEMICAL GROUTING TECHNOLOGY

Proc Amer Soc Civil Eng, J Soil Mech Found Div, Vol 94, No SM1, pp 175-204, Jan 1968. 30 p, 32 fig, 2 tab

American Cyanamid Company, Princeton, N J

DESCRIPTORS-- / *grouting/ *grout curtains/ penetration/ groundwater flow/ *chemical grouts/ gels/ *cutoff walls/ impregnation/ seepage/ injection/ construction/ foundations/ dam foundations/ leakage/ costs/ cutoffs

IDENTIFIERS-- / barriers/ grout coverage/ grout mixes/ *chemical grouting

FOUNDATIONS

R202987 68A UNDERSEEPAGE CONTROL FOR EARTH DAMS
This paper describes and evaluates methods of underseepage control for earth dams. Use of steel sheet piling for a cutoff wall in alluvium has almost disappeared; however, 2 recent developments may revive the use of this piling: a vibrating hammer to drive the piling, and bentonite mud to plug the piling interlock. One advantage of steel sheet piling is speed of installation. Steel sheet piling can be driven by a vibrating hammer for approximately $0.25/sq ft. There are problems and successes in creating an impervious barrier or curtain in rock foundations by grouting. A new vacuum drill pulls the drill cuttings up through a hollow drill stem, eliminating the problem of sealing the voids adjacent to the drill hole. Special consideration must be taken when grouting soft rock foundations. Advantages of adding bentonite to grout are given. A partial cutoff is proposed for those situations where some seepage can be tolerated. Methods are discussed for estimating the underseepage through a foundation prior to constructing the embankment.

R202987 68A

Sherard, James L

SOME CONSIDERATIONS CONCERNING UNDERSEEPAGE CONTROL FOR EARTH DAMS

Pap, Conf Recent Develop Design Constr Earth Rockfill Dams, Univ California, Berkeley, Mar 1968. 29 p, 2 fig, 13 ref

DESCRIPTORS--/ *earth dams/ *dam foundations/ *sheet piling/ seepage/ *underseepage/ *grouting/ grout curtains/ cutoffs/ cutoff walls/ pile driving/ cutoff trenches/ vibrators (mechanical)/ bentonites/ drilling/ drill holes/ cracks/ foundations/ costs/ rock foundations

IDENTIFIERS-- / steel piles/ curtain walls/ seepage control/ reservoir leakage

HYDRAULICS

R202957X67A ROUGHNESS COEFFICIENTS FOR LINED CANALS
A table of values is given of roughness coefficients for lined canals for hydro plants. Values of n recommended by 4 USSR agencies including minimum, average, and maximum values are listed. Classes of concrete lining surfaces include: (1) smooth cement plaster with cement wash; (2) cast in steel forms with smoothed joints; (3) plastered with mortar smoothed with wood float; (4) cast in wood forms, not plastered or smoothed; (5) gunite with smoothing and cement wash; (6) unplastered surface placed without care; (7) gunite with smoothing but without cement wash; and (8) gunite without smoothing. Stone linings include: (1) cyclopean masonry in cement mortar; (2) dry stone masonry; (3) cobblestone paving; (4) cobblestone riprap; and (5) broken stone riprap. Maximum values of n should be used when selecting dike crest levels of nonself-regulating canals and determining head losses and firm power. The average value should be used if the design is intended to establish the average annual loss of energy over a longtime period.

R202957X67A

Vasil'ev, Yu S

DESIGN ROUGHNESS COEFFICIENTS OF LINED CANALS FOR HYDROELECTRIC POWER PLANTS

Hydrotech Constr, No 5, pp 465-467, May 1967. 3 p, 1 tab, 10 ref

DESCRIPTORS--/ *roughness coefficients/ *open channel flow/ *canals/ canal linings/ hydraulics/ head losses/ *flow resistance/ Kutter formula/ foreign design practices/ design criteria/ hydroelectric powerplants

IDENTIFIERS-/ *lined canals/ friction coefficient (hyd)/ Chezy formula/ USSR/ intakes

R202973 67A PARTICLE SIZE AND DIFFUSION BY TURBULENCE
Particle diffusion of 6 sizes of nylon particles was observed, recorded, and analyzed. Experimental apparatus was designed and particles were selected to achieve the following: (1) restriction of the particle motion to a horizontal plane thereby eliminating the effect of gravity, (2) elimination of particle-to-particle collisions by observing the motion of widely separated individual particles, (3) elimination of the effect of particle density by using nearly neutrally bouyant particles, and (4) a homogeneous and isotropic field of fluid motion in which particle diffusion occurs without mean motion. Motion of individual particles was recorded on motion picture film, which was subsequently projected for displacement measurements. The particle-displacement data were analyzed using the diffusion theory of continuous movement. Final report to the Federal Water Pollution Control Administration on Grant 5 R01 WP00912-02 ESE. Has 19 references.

R202973 67A

Majumdar, Hirendra and Carstens, M R

DIFFUSION OF PARTICLES BY TURBULENCE: EFFECT OF PARTICLE SIZE

Water Resources Center, Georgia Inst Technol Rep WRC-0967, Dec 1967. 102 p, 12 fig, 12 tab, 19 ref

Georgia Institute of Technology, Atlanta

DESCRIPTORS-/ *diffusion/ *particle size/ *turbulence/ bibliographies/ particles/ turbulent flow/ *settling velocity/ instrumentation/ data reduction/ experimental data/ diffusivity

IDENTIFIERS-/ diffusion coefficient

R202996 68A HYPERVELOCITY IMPACT ROCK DISINTEGRATION
Hypervelocity water jets have been investigated intensively, largely in USSR, for possible application in cutting and breaking rock. Jets of solid particles from shaped charge explosives and hypervelocity projectiles are of interest because of their penetrating power. Hypervelocity flow processes involve complex unsteady flow of liquids, solids, and gases. Appropriate equations of state are required for numerical solutions of equations of motion. Equations of state have been approximated only for a few material behavior regimes, and little is known about properties of materials subjected to high dynamic pressures. Solutions of problems in creating ultra-high pressures and velocities have proved difficult and much research is required before successful engineering applications can be made of hypervelocity processes. Has 26 references.

R202996 68A

Clark, G B; Haas, C J; Brown J W; et al

RECENT RESEARCH IN HYPERVELOCITY IMPACT ROCK DISINTEGRATION

Amer Soc Mech Eng Publication, 68-FE-45, 1968. 9 p, 11 fig, 1 tab, 26 ref

University of Missouri, Rolla

DESCRIPTORS-/ high pressures/ velocity/ pressure distribution/ impact tests/ impact/ blasts/ shock (mechanics)/ shock waves/ dynamics/ flow/ explosions/ liquids/ gases/ *fluid flow/ *jets/ *supersonic flow/ rock excavation/ rocks/ disintegration/ nozzles/ penetration/ research and development/ hydrodynamics

IDENTIFIERS-/ shaped charges/ *projectiles/ equations of state/ rock breakage/ *high velocity/ *jet piercing/ *hypersonic flow

R203001X68A OPTIMIZATION OF PRESSURE CONDUIT SIZES
Various methods of determining pressure conduit sizes are examined. Although attempts have been made to produce direct solution methods, demonstrating the correctness of the results obtained by such methods is difficult when these methods are applied to different configurations and economic conditions than those under which the methods were developed. The parallel-tangent method is useful and reasonably quick for determining an optimized selection of sizes of different elements of a pressure conduit. This method is less effective if considerable flow at less than full-load conditions occurs, and when 1 conduit serves multiple pumps. This also applies to the direct-solution method. There is a need for developing adjustment procedures for the parallel-tangent and direct-solution methods to describe moderate load factors effectively. An application of the parallel-tangent method to the case of the pumped-storage scheme pressure conduit is given.

R203001X68A

Barr, D I H

OPTIMISATION OF PRESSURE CONDUIT SIZES

Water Power, Vol 20, No 5, pp 193-196, May 1968. 4 p, 7 fig, 13 ref

University of Strathclyde, Glasgow, Scotland

DESCRIPTORS-- / *pressure pipes/ sizes/ *pressure conduits/ head losses/ *penstocks/ *optimum design/ pumped storage/ pressure tunnels/ costs/ pipelines/ foreign design practices/ graphical analysis/ conduits

IDENTIFIERS-- / economic evaluation/ Great Britain/ optimization

R203005 67A RECENT WORK ON DENSITY CURRENTS
The paper reviews recent work on the engineering aspects of density currents or stratified flow. Stratified flow involves the movements of several masses of the same fluid, each mass having a slightly different density but having other physical characteristics approximately identical. The effects of gravity, equilibrium, and interfacial stability are covered. Laboratory model studies on interfacial tension in stratified flow in smooth rectangular channels are summarized, and the problem of extrapolating results to different channel forms is discussed. Practical problems cited included: (1) selective withdrawal, (2) salt wedge intrusion in estuaries, (3) control of salt wedges by air bubble curtains, and (4) mixing of jet discharges. At the present time, many stratified flow problems have not been resolved, but with a good knowledge of theoretical and experimental results the engineer can solve certain problems and determine the order of magnitude for others. Has 21 references.

R203005 67A

Valembois, J

RECENT WORK ON DENSITY CURRENTS

La Houille Blanche, No 1, pp 15-20, 1965. Transl from French, Bur Reclam Transl 670, Sept 1967. 21 p, 1 fig, 21 ref

DESCRIPTORS-- / density/ *density currents/ *fluid flow/ *stratification/ *fluid mechanics/ diffusion/ reviews/ salinity intrusion/ saline water/ hydraulics/ mixing/ jets/ suspended sediments/ salt water barriers/ estuaries / bibliographies

IDENTIFIERS-- / foreign research/ France/ *stratified flow/ selective level releases/ interfaces

HYDRAULICS

R203007 67A PIPELINE SURGING WITH STEADY INFLOW
Surges of head and discharge were studied experimentally in a laboratory pipe system having check structures spaced equally along the pipe. Surges developed when the downstream portion of the check structures did not flow full. The surges were initiated by releasing air entrained in the downstream leg of the check structures, and were amplified as the flow passed through the successive pipe reaches. The experiments were made of various inflows steady at the upstream end of the system. Plots of surge magnitude against inflow rate showed 2 peaks. One peak resulted from surges initiated by air release through the vent downstream of the check structures; the other peak originated from surges initiated by air release through the downstream leg of the check structure. The nonlinear momentum equation was integrated numerically to predict the growth of the discharge surge from 1 pipe reach to the next. Results were in good agreement with the experiments for different head loss conditions and for pipe reaches with and without surge tanks.

R203007 67A

Holley, E R

SURGING IN A LABORATORY PIPELINE WITH STEADY INFLOW

Bur Relam Lab Rep Hyd-580, Hydraul Br, Sept 1967. 59 p, 20 fig, 3 tab, 7 ref, append

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ *pipelines/ *surges/ *water pipes/ *pipes/ hydraulic models/ laboratory tests/ surge tanks/ closed conduit flow/ flow/ air entrainment/ fluid mechanics/ computer programming/ hydraulics/ check structures/ oscillation/ momentum/ fluid flow

IDENTIFIERS-- / *pipeline surges/ Runge-Kutta method/ surge waves

HYDROLOGY

R202941 68A SNOWMELT SHORT-TERM DISCHARGE FORECASTING
Snow sensor data are being used advantageously in long-range water supply forecasting and, as sensor networks increase in scope and number, the value of these data will increase. However, application in the area of short-range discharge forecasting is not so apparent. Accuracy of any short-range discharge forecast procedure is basically determined by the snowmelt and surface flow unitgraphs for each particular basin. Consideration must also be given to present limitations in accurately predicting future temperatures and precipitation at high elevations and the great effect these parameters can have on short-range discharge. The most helpful discharge forecast appears to be several flows that express a probability range tailored to the hydrographer's needs.

R202941 68A

Barsch, Ray E and Burnash, Robert J C

FORECASTING SHORT-TERM DISCHARGE FROM SNOWMELT

Pap Western Snow Conf, Stateline, Nev, Apr 1968. 11 p, 5 plate, 2 ref

State Department of Water Resources, Sacramento, Calif; Environmental Science Services Administration, Salt Lake City, Utah

DESCRIPTORS--/ *snowmelt/ snow surveys/ *runoff forecasting/ *streamflow forecasting/ forecasting/ weather forecasting/ thunderstorms/ sensors/ temperature/ atmospheric precipitation/ hydrology/ moisture content/ water supplies/ errors/ instrumentation/ streamflow

IDENTIFIERS-- / California/ Kings River Watershed Calif/ pressure pillow gages/ pillows (hydraulic)

R202968 67A TRANSVERSAL DRIFTS IN BOTTOM PROFILE

The study of transversal drifts in bottom profiles is to be conducted as a field experiment. The specific site for the experiments is Fernandina Beach, on the northeastern coast of Florida. Changes in the transversal profile can be attributed to both transversal and longshore movement of sand. The primary mechanism of littoral processes are the waves impinging on the coast. The waves induce water particle motion which in turn induces sediment movement. Thus, to fully understand littoral processes it is important to measure both sediment transport and physical parameters responsible for such transport. The quality of measurements obtained in the field is largely dependent on the measuring devices or instrumentation employed and considerable emphasis has been placed on measuring the physical environment. The measuring system that has evolved is one of the best systems for measuring the littoral zone anywhere in the world. Results obtained demonstrate the reliability and accuracy of the measuring system. The information that is being collected is unique. It is the first time that a direct correlation between the water particle velocities, waves, and other physical parameters and the sediment transport measured has been obtained in the field.

R202968 67A

Dean, Robert G and Thornton, Edward B

TRANSVERSAL DRIFTS IN BOTTOM PROFILES--PROGRESS REPORT

Federal Water Pollut Contr Admin Rep, Washington, DC, Sept 1967. 40 p, 16 fig, 5 ref

University of Florida, Gainesville

DESCRIPTORS--/ *littoral drift/ *sediment transport/ instrumentation/ anemometers/ shores/ *beach erosion/ beach sands/ waves/ current meters/ piers/ sand traps/ measuring instruments/ bed load/ *littoral/ waves (water)/ pressure measuring instruments/ ocean currents/ profiles/ *bottom sediments
IDENTIFIERS--/ water particle velocities/ wave measurements/ surf zone/ Fernandina Beach, Florida/ wave height

R202992 67A PIPE WRAPS AND COATINGS

Protective coatings and wrapping materials for the exterior of steel pipes were tested in the laboratory. Complete results are reported from investigations started in 1951. Fifty-eight materials were evaluated for resistance to stresses developed by wetting and drying of clay soils and to puncturing from hard clods and rocks. Exposure conditions were simulated by the soil stress test, subjecting specimens buried in a clay soil to wetting and drying conditions. Resistance to puncturing was measured by an indentation test. Fifteen protective coating systems offered good resistance to soil stresses and indentation.

R202992 67A

Uyeda, H K

PERFORMANCE OF PIPE COATINGS AND WRAPS IN LABORATORY SOIL TEST

Bur Reclam Lab Rep ChE-64, Chem Eng Br, Nov 1967. 76 p, 62 fig, 3 tab, 3 ref, append

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ coal tar coatings/ *coatings/ *protective coatings/ test procedures/ exposure/ glass fibers/ *wetting and drying tests/ tapes/ polyethylenes/ laboratory tests/ shrinkage/ *steel pipes/ corrosion control/ clays/ environmental tests/ backfills/ materials testing/ pipes/ pipelines
IDENTIFIERS--/ *pipe wrappings/ punctures/ *buried pipes/ holidays (coatings)/ product evaluation

MATERIALS ENGINEERING

R203003X68A LARGE BORE HD POLYETHYLENE PIPE

The almost universal acceptance in Britain of plastic pipe as a major material for handling water, waste, and chemicals has resulted in rapidly increasing production by a few large manufacturers and a big investment in research and development. The development in Finland of seamless extruded high-density polyethylene pipe with diameters up to 48 in. increases the opportunities for using plastic pipe. With an established service history, there are now few instances where technical suitability will be questioned, and plastic pipe may be considered for sites with extremely corrosive conditions, difficult laying conditions, or when flexibility is an advantage. The usual criterion of choice is the cost of installed pipe, compared with other materials. High-density polyethylene appears economical for very large size pipe when considering manufacturing advantages and favorable characteristics, compared to available alternatives in traditional pipe materials. Resistance to chemicals and corrosion, calculation of wall thickness, joining methods, and underwater crossings are discussed.

R203003X68A

Aron, H

LARGE BORE HD POLYETHYLENE PIPE

Pipes Pipelines Int, Vol XIII, No 4, pp 39-42, Apr 1968. 4 p, 4 photo

Plastic Constructions Ltd, Birmingham, Great Britain

DESCRIPTORS-/ *pipelines/ *pipes/ *water pipes/ pressure pipes/ conduits/ pressure conduits/ plastic tubing/ *polyethylenes/ plastics/ physical properties/ plumbing/ thickness/ corrosion/ flexible tubing/ materials/ flexibility/ chemical stability

IDENTIFIERS-/ polyvinyl chloride/ *plastic pipes/ corrosion resistance/ foreign products/ chemical resistance/ pipe laying/ pipe joints

MECHANICAL ENGINEERING

R202999X68A HYDROGENERATOR THRUST BEARINGS

Hydrogenerators with vertical shafts must have a thrust bearing capable of carrying the weight of the generator rotor and the thrust external to the generator. This external load consists of the weight of the turbine runner and shaft and the downward thrust of water on the projected area of the runner. On a vertical multijet impulse turbine the external thrust consists of only the weight of the turbine shaft and runner. On Francis or propeller turbines there is considerable hydraulic thrust in addition to the weight of the turbine rotating parts. On Francis turbines the total external thrust may equal or exceed the weight of the generator rotor, while on Kaplan or fixed-blade propellor units the thrust may be several times the weight of the generator rotor. The massive forces on modern hydrogenerator thrust bearings make their design, installation, and lubrication extremely critical. Types of thrust bearings capable of supporting these heavy loads and special lubrication methods are discussed.

R202999X68A

Roth, H H

HYDROGENERATOR THRUST BEARINGS

Allis-Chalmers Eng Rev, Vol 33, No 1, pp 25-28, 1968. 4 p, 8 fig, 1 tab

Allis-Chalmers Manufacturing Co, Milwaukee, Wis

DESCRIPTORS-/ *hydraulic turbines/ *electric generators/ lubrication/ *thrust bearings/ high pressures/ Kaplan turbines/ Francis turbines/ loads/ mechanical engineering/ electric insulation/ electric currents/ magnetic fields/ hydroelectric power/ *hydraulic machinery/ weight

IDENTIFIERS-/ rotating machines/ machine design

R203006 67A CALCULATING CRITICAL ROTOR SPEEDS
A method is presented for calculating critical speeds and constrained vibrations of the rotor of a hydraulic unit, considering the important structural parameters of elasticity of the support, gyroscopic effect of mass settlement, and variable rigidity of the rotor. Design calculations should include these factors for modern, powerful hydraulic units, such as those at the Krasnoiarsk Powerplant in the USSR. The rotor is considered as a vibrating string with 2 or 3 seated masses dividing it into several parts. A. N. Krylov's method of initial parameters can be used for calculating shafts on an elastic foundation and critical speeds of rotors. The method is equivalent to substituting a system of differential equations with constant coefficients representing the different rotor parts for a differential equation with variable coefficients. The solution is written using functions formed by normal fundamental systems. Initial parameters used values for weights, moments of inertia of the mass, and flexibility of the support. Examples of solutions are given and compared with results of calculations for critical speeds without considering these factors. Using electronic computers, the functions can be calculated according to factorization formulas containing 3 to 4 factors.

R203006 67A

Bugov, A U

INCREASING THE ACCURACY OF DESIGN CALCULATIONS FOR CRITICAL SPEEDS OF THE ROTOR OF A HYDRAULIC UNIT BY THE METHOD OF INITIAL PARAMETERS

Energomash, No 11, pp 6-10, 1964. Transl from Russ, Bur Reclam Transl 692, Aug 1967, 18 p, 1 fig, 3 tab, 7 ref

DESCRIPTORS-- / rotation/ rotating components/ turbine runners/ *critical speed/ mathematical analysis/ differential equations/ boundary values/ flexible foundations/ eccentric loading/ moments of inertia/ rigidity/ shafts (machinery)/ *hydraulic turbines/ structural analysis/ machines/ *vibrations/ generators/ structural behavior/ elasticity/ stress
IDENTIFIERS-- / stators/ *rotors/ USSR/ *machine design/ gyroscopic effects

R203008 67A TURBINE DEFECTS INCREASE CAVITATION
The present manufacturing tolerances used in the USSR turbine building industry are not rigid enough to prevent small deviations in blade shape causing increased cavitation. The author examines mathematically the problem of adding to other cavitation causes the altered shape of the blade profile due to manufacturing defects. He evaluates the changes in the coefficient of cavitation introduced by these defects, and defines the problem as the flow of an ideal noncompressible fluid around a surface differing slightly from plane, and around a nearly circular cylinder. The velocity potential is determined for these 2 problems by the method of the smallest parameter. Special cases used were: (1) deviation of an ideal surface changed according to the sinusoidal law and (2) the deviation appearing as a chance function. Results can be used to examine the problem of flow around real hydraulic turbine blades. Changes in the cavitation coefficient caused by blade shape deviations can reach substantial values, especially in the profile of peripheral sections. Formation of local cavitation pits causes increased erosion and early disruption in power production.

R203008 67A

Aronson, A Ia

EVALUATING THE EFFECT OF ERROR IN BLADE MANUFACTURE ON THE VALUE OF THE COEFFICIENT OF CAVITATION

Energomash, No 8, pp 1-5, 1966. Transl from Russ, Bur Reclam Transl 700, Aug 1967, 16 p, 3 fig, 3 tab, 5 ref

DESCRIPTORS--/ *foreign design practices/ turbines/ *cavitation/ turbine parts/ *turbine blades/ hydraulics/ hydrodynamics/ cylindrical bodies/ tolerances (mechanics)/ manufacturing/ fluid flow/ *hydraulic turbines/ mathematical analysis/ boundary values/ velocity/ ,model tests/ errors/ velocity distribution/ defects/ geometric shapes/ fabrication
IDENTIFIERS-- / USSR/ machine design

OPERATION AND MAINTENANCE

R202995X68A EVALUATING COST OF CONTRACT MAINTENANCE
Little information is available for calculating relative costs of maintenance performed by company employees versus contract crews. Although this problem has generally been viewed as not amenable to objective analysis, a solution is suggested. A plant maintenance force that is either too large or too small causes unnecessary expense. In fact, the penalties for over- or understaffing a company maintenance force are more crucial financially than the difference in pay rates between company and contract forces. The optimum size of a company force can be estimated when some idea of workload fluctuation is given. The method presented determines the optimum plant work force of a contract crew, based on data obtained from 1 plant. A formula is developed and applied to the annual maintenance costs for 3 estimates of contract labor rates based on 1962 and 1963 data and workload distribution.

R202995X68A

Jordan, James H

HOW TO EVALUATE THE ADVANTAGES OF CONTRACT MAINTENANCE

Chem Eng, Vol 75, No 7, pp 124-130, Mar 25, 1968. 4 p, 2 fig, 4 tab, 2 ref

Atlas Chemical Industries, Wilmington, Del

DESCRIPTORS-- / *maintenance/ costs/ work/ *maintenance personnel/ job analysis/ management/ contracting/ economies/ wages/ industrial plants/ analysis/ labor/ probability/ industrial relations/ operation and maintenance

IDENTIFIERS-- / optimization/ *cost analysis/ *cost savings/ annual costs

PROJECT PLANNING

R202954X67A HYDROELECTRIC DEVELOPMENT OF THE DNIEPER
The V I Lenin Dnieper Hydroelectric Powerplant, commissioned in 1932, began the multipurpose hydroelectric development of the Dnieper, the third largest river in Europe. The 6 hydroelectric complexes provide: (1) river regulation, (2) flood control, (3) irrigation and industrial water, (4) electric power, and (5) deepwater transport from the Black Sea to Kiev. A review is presented of the history and planning of this large hydroelectric project for development of the Ukrainian USSR water resources. Kiev Powerplant, the first pumped-storage installation in the USSR, was also the first to have horizontal capsule turbine units installed for energy-water-transport purposes and became a prototype for low head plants on flat rivers. Kakhov Powerplant was the site of several hydroconstruction innovations. Foundation material for concrete structures at the Kakhov site was a soft soil consisting of fine grained sands with silty lenses. Has 41 references.

R202954X67A

Baksheev, E A; Dotsenko, T P; Kadomskii, G D

THE DNIEPER RIVER HYDROELECTRIC POWER STATION SEQUENCE

Hydrotech Constr, No 5, pp 406-417, May 1967. 12 p, 9 fig, 41 ref

DESCRIPTORS-/ hydroelectric powerplants/ project planning/ flood control/ irrigation/ *multiple purpose projects/ industrial water/ construction/ bibliographies/ river regulation/ hydroelectric power/ hydraulic fills/ precast concrete/ pumped storage/ foreign projects/ navigation/ dams

IDENTIFIERS-- / USSR/ Ukrainian SSR/ *Dnieper River, USSR/ bulb turbines/ river cascade systems

R202939X68A GRAPHICAL STABILITY ANALYSIS OF SLOPES
The stability of a jointed rock mass is analyzed by graphical projections on a reference hemisphere, using either stereo nets or equal-area nets. The graphical method provides a speedy and practical technique for evaluating the effects of a 3-dimensional planar geologic structure on the stability of a rock slope. The effects of remedial measures can also be evaluated. Elements of hemispheric projection illustrated on equal-area nets and spatial views are: (1) equatorial nets, (2) meridional nets, (3) pole diagrams, (4) great circles, (5) small circles, and (6) friction cones. An example shows the use of these elements in geologic and engineering phases of a slope stability study. Consideration was given to wedge-type slides along 2 planes and block-type movements on 1 plane with the opening of the other plane. Blank forms of the 3 nets are included.

R202939X68A

John, Klaus W

GRAPHICAL STABILITY ANALYSIS OF SLOPES IN JOINTED ROCK

Proc Amer Soc Civil Eng, J Soil Mech Found Div, Vol 94, No SM2, pp 497-526, Mar 1968. 30 p, 13 fig, 2 tab, 12 ref, 2 append

University of Karlsruhe, Germany

DESCRIPTORS-/ *graphical analysis/ slopes/ rocks/ sliding/ *stability analysis/ three-dimensional/ *rock mechanics/ engineering geology/ charts/ geometry/ safety factors/ landslides/ shear strength

IDENTIFIERS-/ projection/ *rock slope stability/ joint systems/ rock joints/ projective geometry/ jointed rock/ geologic defects

R202955 68A STABILITY ANALYSIS OF ROCK SLOPES
Failure of a rock mass is dictated by the presence of geological surfaces of separation. Equilibrium conditions can be analyzed 3-dimensionally, provided the planes of weakness are known. Forces resulting from water percolation are taken into account. Equilibrium conditions are considered in terms of the various parameters involved, including pore pressures and shear strength. The problem is studied in space geometry and solved using zones and curves on a unit radius sphere. Mapping of the sphere provides practical graphs where weighting of different parameters can be evaluated, and the engineer is able to assess the conditions of equilibrium.

R202955 68A

Londe, Pierre

STABILITY ANALYSIS OF ROCK SLOPES

Continuing Educ Eng Course, University of California, Berkeley, Mar 1968. 48 p, 22 fig

Coyne and Bellier, Paris, France

DESCRIPTORS-/ *stability analysis/ *rock mechanics/ slopes/ probability/ friction/ rocks/ shear strength/ *transformations/ three-dimensional/ uplift pressures/ earthquakes/ seismic design/ safety factors/ foreign design practices/ pore water pressures/ *graphical analysis

IDENTIFIERS-/ *rock slope stability/ rockslides/ rock joints/ projection/ France

ROCK MECHANICS

R202991 68A RADIAL JACKING TEST FOR ARCH DAMS
Designing arch dams requires knowledge of deformation, creep, and set properties of abutment and foundation rock. A 30-million-lb radial jacking test was made in a gallery of an exploratory tunnel driven into a proposed dam abutment to determine the effects of joints, fractures, and other weaknesses on the deformation characteristics of the rock mass. This paper describes the radial test equipment, instrumentation, and test procedures. A newly developed borehole extensometer was used to measure rock movements at many positions behind the loaded rock surface. This gage could distinguish between closure of joints and elastic deformations of intact rock. Deformations caused by closure of joints and fractures were much greater than those caused by elastic properties of intact rock.

R202991 68A

Wallace, George B; Slebir, Edward J; Anderson, Fred A

RADIAL JACKING TEST FOR ARCH DAMS

Pap, Rock Mech Symp, Univ Texas, Austin, May 1968. 47 p, 24 fig, 6 ref

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ *rock mechanics/ arch dams/ *dam foundations/ dam design/ *abutments/ deformation/ instrumentation/ *rock foundations/ boreholes/ extensometers/ creep/ field tests/ test procedures/ *foundation investigations

IDENTIFIERS--/ rock properties/ in situ tests/ *radial loads/ flat jack method/ borehole deformation gage/ jointed rock/ *jacking tests

SANITARY ENGINEERING

R202960 67A PHYSIOLOGICAL ECOLOGY OF ACTIVATED SLUDGE
The overall objectives of this research include: (1) isolation, identification, and propagation of bacteria in activated sludge from a conventional treatment plant, (2) use of these cultures individually and as mixtures in oxygen uptake studies to determine the role of cultures in the metabolism of monocarbocylic acids, and (3) measurement of content of individual fatty acids in aeration tank influent. This investigation was made possible by Research Grant WP-00816 from the Federal Water Pollution Control Administration, Department of the Interior. Has 26 references.

R202960 67A

Cibulka, John J and Malaney, George W

EXPERIMENTAL CONDITIONS IN THE STUDY OF THE PHYSIOLOGICAL ECOLOGY OF ACTIVATED SLUDGE

Pap, 22nd Ind Waste Conf, Purdue Univ, Ind, May 1967. 23 p, 9 fig, 1 tab, 26 ref

Vanderbilt University, Nashville, Tenn

DESCRIPTORS--/ cultures/ bacteria/ bibliographies/ *sludge/ ecology/ flocculation/ sanitary engineering/ *sewage treatment/ field tests/ oxidation/ aeration/ *activated sludge/ *physiological ecology/ microorganisms

IDENTIFIERS--

R202971 67A ALGAE AND PROTOZOA DISPERSAL BY INSECTS
Algae and protozoa of 28 different genera were cultured from external washings of 14 species of aseptically collected adult horse flies and mosquitoes. Algae predominated, with 7 genera of blue-greens, 15 of greens, and 1 genus of diatoms; 5 genera of glagellate protozoa were identified in the cultures, although no rhizopods or ciliates were found. Analysis by "t" test showed that the horse flies carried significantly more algae and protozoa than the mosquitoes. Five tabanid species yielded 21 genera; 9 mosquito species of 4 genera yielded 17. Known dispersion distance of some of the diptera studied suggest that the numerous algae and protozoa which they carried could be transported overland from 1 aquatic or moist habitat to another. The data suggest that some diptera contribute substantially to the passive dispersal of large numbers of different algae and protozoa. This study was supported in part by the Federal Water Pollution Control Administration Grant 5 R01 WP00855-02. Has 28 references.

R202971 67A

Revill, Donald L; Stewart, Kenneth W; Schlichting, Harold E, Jr

DISPERSAL OF VIABLE ALGAE AND PROTOZOA BY HORSE FLIES AND MOSQUITOES (DIPTERA: TABANIDAE, CULICIDAE)

Pap, Ann Entomol Soc America, Vol 60, No 5, pp 1077-1081, Sept 1967. 5 p, 3 tab, 28 ref, disc

North Texas State University, Denton

DESCRIPTORS-/ distribution/ transportation/ *mosquitoes/ *dispersion/ *algae/ bibliographies/ biology/ ecology/ sanitary engineering/ *insects/ *diptera/ ecological distribution/ *protozoa/ *entomology

IDENTIFIERS-/ *horse flies

R202972 68A WATER AND SEWAGE SYSTEMS IN WYOMING
The purpose of this compendium is to present relevant descriptive information about the characteristics of the municipal water and sewage systems in Wyoming. This information was obtained by questionnaires submitted to the state's municipalities. The publication includes information for each municipality concerning population, number of residential water connections, number of commercial, industrial, other water connections, total water supplied to all users during given years, water permit numbers and their dates, water cost rate schedules by type of water users, water storage capacity, and type of sewage system.

R202972 68A

Schwer, R Keith

MUNICIPAL WATER AND SEWAGE SYSTEMS IN WYOMING: A SOURCE BOOK OF DATA

Wyoming Water Resources Res Inst, Univ Wyoming, Feb 1968. 124 p

University of Wyoming, Laramie

DESCRIPTORS-/ *municipal water/ *sewerage/ distribution systems/ wells/ water treatment/ water costs/ population/ cities/ municipalities/ water storage/ sewage treatment/ industrial water/ water supply systems/ *data collections/ municipal waste

IDENTIFIERS-/ *Wyoming

R202978 67A CHLOROPHYLL INHIBITION AND SUPPRESSION
This paper describes the inhibition of chlorophyll synthesis in algae due to the presence of selected organic compounds. Emphasis is directed to an explanation of laboratory techniques and an evaluation of oxygen emission. The relative toxicity of 33 phenolic-type compounds and 8 pesticides to chlorella pyrenoidosa were evaluated. Algal cultures were grown in test tubes which were chemostated and under continuous illumination for a test period of 72 hr. The relative toxicity was evaluated by measuring changes in chlorophyll content of the algal suspensions. Under such conditions the decrease in chlorophyll content is generally logarithmic to the concentration of the toxic additive. In the case of phenolic-type compounds, the toxicity is a function of the substitute group and their relative position. The direct manometric technique was employed for the measurement of the photosynthetic gas exchange. Results show that oxygen emission is suppressed by chlorinated and nitrated phenols. Federal Water Pollution Control Administration Continuation Grant WP-00688-03. Has 18 references.

R202978 67A

Huang, Ju-Chang and Gloyna, Earnest F

EFFECTS OF ORGANICS ON PHOTOSYNTHETIC REOXYGENATION--PART I: CHLOROPHYLL INHIBITION AND SUPPRESSION OF PHOTOSYNTHETIC OXYGEN PRODUCTION
Rep, Civil Eng Department, Univ Texas, 1967. 46 p, 28 fig, 3 tab, 18 ref

University of Texas, Austin

DESCRIPTORS-/ *organic compounds/ *algae/ photosynthesis/ pesticides/ toxicity/ insecticides/ herbicides/ sanitary engineering/ inhibition/ *chlorophyll/ *chlorella/ phenolic pesticides/ reaeration/ bibliographies

IDENTIFIERS-/ chlorella pyrenoidosa/ phenolic compounds

R202981 67A BEHAVIOR OF SINGLE BUBBLES
This report consists of 2 parts. Part 1 deals with methods of measuring rates of volume change of a rising gas bubble, its surface area, velocity of rise, and the instantaneous mass transfer coefficient. The principle of this method was discussed in Progress Report 2a (1966). However, because of the changes introduced and the reproducibility tests conducted, the method is discussed in this report in detail. Special attention is given to the method of bubble release that proved to be an important factor affecting the consistency of results. Part 2 discusses effects of a homologous series of normal alcohols on mass transfer and drag coefficients of a carbon dioxide bubble. Carbon dioxide was used in the tests instead of air because of its higher solubility in water permitting greater accuracy of results. It may be expected that similar effects would take place in the case of air bubbles and thus help to better understand and possibly improve aeration systems. The study showed the depressing effect of an alcohol on KL increases with its chain length and concentration. A similar consistency of effects was also noticed in the case of drag coefficient which increased with concentration and chain length of the alcohol. Has 55 references.

R202981 67A

Zieminski, Stefan A and Raymond, Delmar R

USE OF CHEMICAL ADDITIVES TO IMPROVE AERATION RATES: STUDY OF THE BEHAVIOR OF SINGLE BUBBLES--PROGRESS REPORT NO 3a

Federal Water Pollut Contr Admin Rep R 848-4, Washington, DC, 1967. 52 p, 19 fig, 55 ref, disc

University of Maine, Orono

DESCRIPTORS-/ *bubbles/ *mass transfer/ gases/ carbon dioxide/ volume/ alcohols/ *aeration/ coefficients/ bibliographies/ drag/ flotation/ high speed photography/ *air entrainment/ bubbling pressures/ size

IDENTIFIERS-

R202982 67A IMPROVING AERATION RATES WITH CHEMICALS
The investigation presented in this report deals with a method for improving the rates of aeration. In order to achieve this objective, small quantities of some organic substances are introduced in the zone of bubble formation. These additives decrease bubble coalescence and improve the rate of transfer because of the substantial increase in the interfacial surface area. The tests were conducted with n-octanol, 4-methyl-2-pentanol and heptanoic acid. At a concentration of 1 ppm the n-octanol and 4-methyl-2-pentanol showed an improvement in the rate of aeration of 70% over that in pure water. At a concentration of only 0.5 ppm n-octanol gave an improvement in the rate of transfer of 30%. Since the design of the aerator and the agent were not optimized, it may be expected that still better effect could be obtained in a large scale installation. Federal Water Pollution Control Administration Grant WP-00562-04. Has 36 references.

R202982 67A

Zieminski, Stefan A and Lessard, Richard R

USE OF CHEMICAL ADDITIVES TO IMPROVE AERATION RATES: STUDY OF MODELS OF AIR DISPERSERS--PROGRESS REPORT 3b

Federal Water Pollut Contr Admin Rep R 848-4, Washington, DC, 1967. 28 p, 11 fig, 36 ref, disc

University of Maine, Orono

DESCRIPTORS-- / *aeration/ *bubbles/ organic compounds/ mass transfer/ *air entrainment/ dispersion/ alcohols/ surface tension/ *organic matter/ surfactants/ fermentation/ activated sludge/ oxygenation/ bibliographies

IDENTIFIERS--

R202944X68A FLEXIBLE CULVERTS UNDER HIGH FILLS
The possibility is discussed of predicting load distribution on a culvert if the fill material, base material, and method of fill are specified. The additional feature of culvert deformation as fill material is placed is considered. Equilibrium culvert modes are considered, and no concern is given to buckling. The base, culvert, and hay inclusion may be considered as a system whose vertical stability is influenced by all the parts and the horizontal flexibility by the culvert alone. Pressures on the crown are decreased with reduced vertical stiffness, and those on the wall are increased with reduced horizontal stiffness. This suggests that the effect of isotropic normal pressure may be attained by proper adjustment of the hay and the base characteristics. After a brief review of the existing state of the problem, important analytical additions are developed and employed in the solution of typical problems.

R202944X68A

Brown, Colin B; Green, David R; Pawsey, Stuart

FLEXIBLE CULVERTS UNDER HIGH FILLS

Proc Amer Soc Civil Eng, J Struct Div, Vol 94, No ST4, pp 905-917, Apr 1968. 13 p, 11 fig, 1 tab, 5 ref, 2 append

Columbia University, New York; Glasgow University, Scotland: University of California, Berkeley

DESCRIPTORS-/ *culverts/ *fills/ *embankments/ flexural strength/ stress analysis/ pressure distribution/ computer programming/ deformation/ load distribution/ stress distribution/ loads/ *soil pressures/ pipes/ dead loads/ *earth pressures/ model tests/ settlement/ foundations

IDENTIFIERS-/ *flexible culverts/ *flexible pipes/ hay/ organic matter/ finite element method

R202948X68A FINITE-ELEMENT METHOD AND SOIL MECHANICS

Finite-element methods can be used in solving problems of continuum mechanics where material has linear or nonlinear properties. The finite-element method is applied to soil mechanics problems, defined either as plane-strain or axially symmetric. Problems have been solved in the linear media of homogeneous, isotropic material and results agreed with closed-form solutions. The finite-element method was extended to nonlinear problems using pseudoelastic constants. These constants were selected so that stress in the finite element for a given strain was the same as stress corresponding to some strain in the continuum. Nonlinear stress-strain relationship was satisfied by an iterative procedure, and nonlinear problems in plane-strain and axially symmetric cases were solved and compared with experimental results. Agreement was observed between the computer solution and experimental results. The finite-element method proved to be a powerful tool for solving problems involving either linear or nonlinear media. Has 15 references.

R202948X68A

Girijavallabhan, Chiyyarath V and Reese, Lymon C

FINITE-ELEMENT METHOD FOR PROBLEMS IN SOIL MECHANICS

Proc Amer Soc Civil Eng, J Soil Mech Found Div, Vol 94, No SM2, pp 473-496, Mar 1968. 24 p, 18 fig, 15 ref, 2 append

Texas Technological College, Lubbock; University of Texas, Austin

DESCRIPTORS--/ strain/ *soil mechanics/ computers/ mechanics/ foundations/ linear systems/ nonlinear systems/ homogeneity/ isotropy/ stress-strain curves/ elastic deformation/ plastic deformation/ elasticity modulus/ stress/ settlement/ stress distribution/ bibliographies/ stress analysis

IDENTIFIERS--/ *finite element method/ plane strain/ stiffness matrix/ shear modulus

R202949X68A EMBANKMENT PORE PRESSURES

Theoretical methods for predicting pore pressures in earth dams are reviewed, and observed pore pressure data from selected dams constructed by the Corps of Engineers (CE) and other agencies are summarized to indicate development and magnitudes of construction pore water pressures in earth dams. Construction characteristics and pore pressure data from 10 CE, 24 USBR, and 9 foreign dams are summarized and compared. The study determined that broad conclusions for all earth dams are difficult to make because of numerous factors influencing pore pressure buildup and that each dam must be treated individually in predicting construction pore pressures. Conclusions from this study are: (1) provisions for internal drainage effectively relieve construction pore pressures in earth embankments; (2) pore pressure ratios in embankment materials increase rapidly as placement water content increases, especially above optimum water content; and (3) pore pressures increase with increasing dam height, but dams less than 100 ft high can experience large pore pressures. Has 56 references.

R202949X68A

Sherman, Walter C and Clough, Gerald W

EMBANKMENT PORE PRESSURES DURING CONSTRUCTION

Proc Amer Soc Civil Eng, J Soil Mech Found Div, Vol 94, No SM2, pp 527-553. 27 p, 11 fig, 4 tab, 56 ref, append

U S Army Engineer Waterways Experiment Station, Vicksburg, Miss; University of Calif, Berkeley

DESCRIPTORS--/ *pore pressures/ pore water pressures/ pore air pressures/ *earth dams/ *embankments/ drawdown/ dams/ bibliographies/ construction/ moisture content/ compaction/ soil classifications/ drainage/ soil mechanics

IDENTIFIERS--/ stress ratio/ construction methods

R202946X68A AN INTEGRATED SYSTEM FOR BUILDING DESIGN

BUILD is a pilot version of a computer system for research in computer-aided building design and a subsystem of the Integrated Civil Engineering System developed at the Massachusetts Institute of Technology. The system provides a problem-oriented language for a limited but integrated description of a building having geometry based on the rectangular parallelepiped and permits the user to: (1) specify a configuration of spaces, (2) indicate the composition of surface materials, (3) generate a structural frame at the edges of the spaces, and (4) make selective takeoffs of areas, volumes, weights, and costs. Geometric and topological data are in a form suitable for subsequent analysis using the Structural Design Language. BUILD is not a practical design system but a tool for studying problems of modeling buildings in computers. Research is directed toward an integrated information base explicitly recording interactions among design data and capable of incremental extension in scope and detail. The current scope of BUILD is illustrated.

R202946X68A

Teague, Lavette C Jr and Hershdorfer, Alan M

BUILD--AN INTEGRATED SYSTEM FOR BUILDING DESIGN

Proc Amer Soc Civil Eng, J Struct Div, Vol 94, No ST4, pp 983-994, Apr 1968. 12 p, 7 fig, 12 ref

Massachusetts Institute of Technology, Cambridge

DESCRIPTORS-- / *buildings/ computer programming/ *structural engineering/ construction costs/ structural analysis/ *structural design/ structural models/ computers/ models/ design/ programs/ programming languages

IDENTIFIERS-- / mathematical models/ *BUILD/ problem-oriented languages

R202967 68A SOIL MOISTURE EXTRACTION BY SINGLE PLANT

A theoretical model was developed to predict the rate of soil moisture extraction by a single plant as a function of various soil and plant parameters. This model treats a plant root as a line sink and the plant as a conduction tube. The soil is assumed to be the controlling factor in transpiration. A laboratory test was performed on mature cotton plants grown in individual pots to determine if the model was valid. To determine the water potential at the plant root interface, which was a parameter of the model, the resistance of the plant to flow was determined. By varying the evaporative demand the plant resistance to flow was measured as a function of the water potential of the plant leaves and the transpiration rate. This determined resistance to flow was then used to determine the water potential at the soil-root interface at later time. The test of the model showed it would not predict the rate of soil moisture extraction for this particular soil-plant system. It is believed that during part of the test period the assumptions underlying the model were not completely met. In particular the soil was assumed to be the controlling factor in transpiration, but at least during periods of low soil moisture tension the plant apparently controlled transpiration. Has 19 references.

R202967 68A

Kenyon, David C and Lambert, Jerry R

PREDICTION OF THE RATE OF SOIL MOISTURE EXTRACTION BY A SINGLE PLANT

Water Resources Res Inst, Clemson Univ Rep 2, Feb 1968. 37 p, 8 fig, 3 tab, 19 ref

Clemson University, South Carolina

DESCRIPTORS-- / *soil moisture/ *evapotranspiration/ absorption/ *plant (botany)/ bibliographies/ *soil-water-plant relationships/ root zone/ *moisture uptake/ *transpiration/ *consumptive use/ soil water movement/ water loss/ conduction

IDENTIFIERS-- / plant-water physics

R202975 66A POLLUTION IN THE LAKE TAHOE BASIN
Lake Tahoe is threatened by nitrogen and phosphorus pollutants from sewage discharged within the basin. The phosphorus content of Lake Tahoe water has reached a critical level. Objectionable algal growths are present in near-shore areas where phosphorus concentrations are highest. A substantial increase in nitrogen, common in human wastes, could create obnoxious algae throughout the lake, destroy its clarity and cause a distasteful sight and smell. Lake Tahoe is threatened by silt erosion from lands where the natural vegetative cover is destroyed and soil is disturbed by land clearing. Silt, transported by runoff during the rainy season, reduces water clarity and beauty; destroys aquatic life and adversely changes composition of organisms that may be present. The following general improvements should be made: (1) establish additional public utility districts, and extend public sewer service to collect all sewage from the drainage area; (2) provide minimum secondary treatment for all wastes collected; (3) export all sewage and garbage out of the Lake Tahoe basin; and (4) minimize the transport of silt into Lake Tahoe by using effective soil conservation and erosion control for lands within the basin.

R202975 66A

West, A W and Mackenthun, K M

REPORT ON POLLUTION IN THE LAKE TAHOE BASIN, CALIFORNIA-NEVADA

Federal Water Pollut Contr Admin, July 1966. 55 p, 6 fig, 6 tab, append

Federal Water Pollution Control Administration, Cincinnati, Ohio

DESCRIPTORS-- / *water pollution/ water quality/ water utilization/ waste disposal/ soil erosion/ turbidity/ sewage effluents/ nitrogen/ lakes/ algae/ phosphorus/ *water quality control/ water pollution control/ waste treatment/ waste water disposal/ *eutrophication/ phytoplankton/ Nevada/ California
IDENTIFIERS-- / *Lake Tahoe

R202977X67A TENDIPES PLUMOSUS IN MINERAL ACID WATER
Tendipedid populations from 19 strip-mine lakes of varying pH were analyzed. Tendipes plumosus (Linne) was the sole tendipedid established in water with measurable potential free acidity. In lakes lacking potential free acidity, T. plumosus, when present, was frequently accompanied by other tendipedid species. It is suggested that the distribution of T. plumosus was not restricted by a mineral acid environment, but was related to the presence of leaf litter. This investigation was supported in part by Federal Water Pollution Control Grant WP-00379.

R202977X67A

Harp, George L and Campbell, Robert S

THE DISTRIBUTION OF TENDIPES PLUMOSUS (LINNE) IN MINERAL ACID WATER

Limnology and Oceanography, Vol 12, No 2, pp 260-263, Apr 1967. 4 p 3 tab, 13 ref

University of Missouri, Columbus

DESCRIPTORS-/ distribution/ water quality/ *midges/ ecological distribution/ distribution patterns/ *strip mine lakes/ acidic water/ leaves/ coal mines/ *coal mines waste/ acidity

IDENTIFIERS-- / *mineral acid water/ leaf litter

R202979 67A REMOVAL OF PESTICIDES FROM WATER
The purpose of this study was to investigate some of the properties of pesticides as they exist in water, and to determine the effectiveness of several water treatment processes in the removal of pesticides from water. Among the pesticides investigated were malathion, DDT, aldrin, dieldrin, captan, benzene hexachloride (BHC), 2,4-D, and 2,4,5-T. The water treatment processes included aeration, chemical coagulation, adsorption on activated carbons and clays, and foam separation. The removal of pesticides from water by aeration was found to be significant. Dieldrin was removed almost 100%, while aldrin, DDT, and BHC were removed to a lesser extent. 2,4,5-T and captan showed no loss through aeration. Chemical coagulation alone was found to be ineffective in the removal of pesticides from water. Several coagulant aids were investigated but all proved ineffective with the possible exception of one which increased the apparent removal slightly. Of the processes investigated adsorption with activated carbon was determined to be the most effective in removing pesticides from water. The removals obtained were: malathion near 100%; 2,4-D, 90%; DDT, 95%; aldrin, near 100%; dieldrin, 90%. FWPCA Contract WP-00476-02 and OWRR Contract 14-01-001-911. Has 51 references.

R202979 67A

Whitehouse, James D

STUDY OF THE REMOVAL OF PESTICIDES FROM WATER

Water Resources Inst Res Rep 8, 1967. 175 p, 64 illus, 5 tab, 51 ref

University of Kentucky, Lexington

DESCRIPTORS-/ *pesticides/ aeration/ adsorption/ *water/ sanitary engineering/ water treatment/ coagulants/ bibliographies/ *pesticide removal/ aldrin/ DDT/ dieldrin/ 2,4-D/ foam separation/ 2,4,5-T/ coagulation

IDENTIFIERS-/ malathion/ captan/ benzene hexachloride

R202980 66A ALGAL GROWTHS IN LAKE SEBASTICOOK, MAINE
The purpose of this study was: (1) to identify major sources of nutrients to Sebasticook Lake, (2) to assess their significance, and (3) to recommend the most feasible nutrient control measures that will effect a lasting reduction in the aquatic growths. These nuisance growths are caused principally by nutrients contained in domestic and industrial plant wastes that are discharged to the east branch of the Sebasticook River at Dexter and Corinna, Maine. These nutrients produce as much as 9,700,000 pounds of algae as a standing crop within the lake during those days of the year that are optimum for algal development. Algae are swept by winds and waves into bays and coves where they decompose in the hot sun forming a "green-paint" covering on rocks, boats, and piers, releasing a pungent pig-pen odor in decay. Chemical control of the algal nuisance would be temporary, would require repeating several times throughout a growing season, and could cost as much as $40,000 annually. Algae would develop between treatment, negating control. Several recommendations are given to effect a lasting reduction in the extent of aquatic growths in Lake Sebasticook. Among these are initiation of good housekeeping practices at the sources of pollution. Has 44 references.

R202980 66A

Anon

FERTILIZATION AND ALGAE IN LAKE SEBASTICOOK, MAINE

Federal Water Pollut Contr Admin Rep, Jan 1966. 124 p, 12 fig, 28 tab, 44 ref, append

Federal Water Pollution Control Administration, Cincinnati, Ohio

DESCRIPTORS-/ *algae/ wave action/ water pollution/ sewage treatment/ plankton/ waste disposal/ water utilization/ dissolved oxygen/ domestic wastes/ sediments/ water treatment/ bibliographies/ lakes/ *nutrients/ *eutrophication/ industrial wastes/ *fertilization/ *algicides/ diatoms

IDENTIFIERS-/ *Lake Sebasticook, Maine

WATER POLLUTION

R202983 67A INDUSTRIAL WASTE FROM PETROLEUM REFINING
This industrial waste water profile covers the petroleum refinery industry in the United States as defined by Standard Industrial Classification 2911 of the U S Department of Commerce. It does not cover the production of crude oil or natural gas from wells or the natural gasoline and other operations associated with such production. Transportation of petroleum products is covered only to the extent that it is a part of refinery pollution control, such as treatment of ballast water. The principal areas of discussion are: (1) the fundamental manufacturing processes and their patterns of use, (2) water use and reuse, (3) waste quantities and characteristics, (4) waste reduction practices (including both waste treatment and in-plant processing) and their effectiveness, and (5) waste treatment costs. In each area of discussion trends have been projected to or estimates made for the situation expected in 1977. Has 96 references.

R202983 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO 5 PETROLEUM REFINING

Federal Water Pollut Contr Admin, Publication IWP-5, 1967. 74 p, 24 fig, 19 tab, 96 ref, 6 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ wastes/ *industries/ water reuse/ waste disposal/ costs/ industrial plants/ economics/ water quality/ treatment facilities/ *oil industry/ *oil wastes/ byproducts/ industrial wastes/ waste water disposal/ waste water treatment/ waste treatment/ bibliographies

IDENTIFIERS-- / *refineries

WATER RESOURCES

R202962X67A RECREATIONAL USE OF INLAND WATERS
An indepth analysis of applicable case law allocating ownership and access rights to inland water resources is given. Consideration is directed at the historical development of pertinent principles of water resource allocation adopted by the several states. Attention is directed at the potential for realizing recreational objectives in the context of existing case law. Alternative plans are presented for absorption of recreational inland water facilities by governmental acquisition. Has 82 references.

R202962X67A

Reis, Robert I

POLICY AND PLANNING FOR RECREATIONAL USE OF INLAND WATERS

Reprint, Temple Law Quart, Vol 40, No 2, pp 155-193, 1967. 39 p, 82 ref

University of Connecticut, Storrs

DESCRIPTORS--/ *riparian rights/ *recreation/ bibliographies/ lakes/ reservoirs/ streams/ planning/ *water laws/ water utilization/ boating/ navigable waters/ eminent domain/ lake beds/ water sports/ tidal waters/ recreation demand/ recreation facilities/ watercourses (legal)

IDENTIFIERS--

WATER RESOURCES

R202976X67A CONNECTICUT WATER LAW
More than 200 Connecticut water right cases are reviewed to give a historical perspective and a basis for future planning, developing, and allocating water resources. The courts have developed 4 distinct water categories: (1) public surface water flowing in a definite channel, (2) private surface water flowing in a channel, (3) ground water, and (4) diffuse surface water. This classification respectively involves public and private rights in public water, riparian rights, ground water rights, and surface water. Although the classification is arbitrary and may not always be in accord with the physical nature of the problem, the system forms the basis for the discussion of legal rights and the use of water in Connecticut. A chronological listing of Connecticut water law cases and pertinent sections of Connecticut General Statutes are given in the appendices.

R202976X67A

Reis, Robert I

CONNECTICUT WATER LAW: JUDICIAL ALLOCATION OF WATER RESOURCES

Inst Water Resources Rep 4, Univ of Connecticut, 1967. 215 p, 6 append

University of Connecticut, Storrs

DESCRIPTORS--/ *riparian rights/ beaches/ reservoirs/ recreation/ real property/ surface water/ navigable waters/ Connecticut/ eminent domain/ *Federal-State water rights conflicts/ groundwater/ prescriptive rights/ *water law/ tidal waters/ reclamation/ *water rights/ legal aspects/ judicial decisions/ watercourses (legal)
IDENTIFIERS--

MISCELLANEOUS

R202937 66A REMOTE SENSING
Remote sensing is acquisition of information about an object or phenomenon not in intimate contact with the information-gathering device. Our natural remote sensors, i.e., eyes, ears, and skin, are surprisingly limited in this respect, and we have had to supplement them over the years with a variety of devices for measuring emitted radiation and force fields, thus enabling events to reveal themselves. Today, remote sensing techniques are beginning to yield otherwise unobtainable information about the world around us. Some examples are: (1) detecting forest fires with infrared sensors, (2) mapping ice thickness and distribution with microwave devices, (3) spotting diseased crops with certain cameras, and (4) measuring moisture content of soils with radar. These and many other applications have aroused enthusiasm among a diversity of scientists in areas ranging from agriculture to zoology. Ability to acquire data is far ahead of the ability to interpret and manage it. Probably 90% of the data gathered to date has not been utilized. Much of the promise of remote sensing will be lost if more efficient processing and use of data are not developed.

R202937 66A

Parker, Dana C and Wolff, Michael F

REMOTE SENSING

Pap Remote Sensing Environ, Amer Soc Photogram, July 1966. 12 p, 8 fig, 1 tab

DESCRIPTORS--/ *sensors/ infrared rays/ *radiation measurement/ *aerial photography/ *radar/ satellites (artificial)/ environment/ snow surveys/ electromagnetic properties/ cameras/ wave length/ photographs/ thermal radiation/ photography/ ultraviolet rays/ electromagnetism/ microwaves/ agriculture/ geological surveys/ hydrology/ oceanography
IDENTIFIERS-- / *remote sensing/ color photography/ infrared imagery/ ice cover

R202963 66A DOLINE LAKE LIMNOLOGY
Few investigations have been carried out on limestone sink or doline basin lakes in any area of their occurrence. Almost no information is available on the Florida lakes. The purpose of this investigation was to characterize 2 such lakes (with differing physical features) in terms of physical, chemical, and biological parameters and to attempt to determine the factors which limit biological productivity in these lakes. This report contains a summary of the field and laboratory work carried out in investigating 2 lakes, Lake Mize and Newnan's Lake over 2-yr periods, and a third, Biven's Arm over a 1-yr period. All 3 lakes are in Alachua County, Florida. This is the final report to the Federal Water Pollution Control Administration on Grant NIH WP 00530 01-3, January 1, 1964-December 31, 1966.

R202963 66A

Nordlie, Frank G

CHEMICAL AND BIOLOGICAL DYNAMICS IN TWO SOLUTION LAKES

Federal Water Pollut Contr Admin Rep, Bethesda, Md, Dec 1966. 53 p, 15 tab, 14 fig, 4 ref

University of Florida, Gainesville

DESCRIPTORS--/ limestones/ *limnology/ *lakes/ physical properties/ chemical properties/ measurement/ water analysis/ water quality/ plankton/ aquatic life/ lake morphology/ *sinks/ Florida/ *biological properties

IDENTIFIERS-/ Lake Mize, Florida/ Newnans Lake, Florida/ Bivens Arm Lake, Florida

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R203032 68A CONDEMNATION OF WATER RIGHTS
In view of the evident probability that there will be increasing resort to eminent domain to acquire rights to water supply, American statutes and court decisions, with emphasis upon Texas laws, were collected and analyzed to identify significant problems and make suggestions for their solution. Study was focussed upon the following: (1) the extent to which authority to condemn water rights exists, the laws of Texas being selected for exhaustive analysis for this purpose; (2) the standards for substitution of water uses by eminent domain; (3) the applicability and implications of inverse condemnation; and (4) valuation of water rights and other factors affecting cost of acquisition. General conclusions were: (a) in the state selected, the authority to condemn water rights is unclear in some respects and not as broad as might be desired; (b) legislatures and courts have barely tackled the critical task of stating preferences for substitution of water uses by eminent domain; (c) inverse condemnation of water rights may have harsh consequences, some of which can be minimized; and (d) the cost of acquisition of water rights by eminent domain is substantial, but can be reduced by methods applicable in certain situations. Has 230 references.

R203032 68A

Johnson, Corwin W

CONDEMNATION OF WATER RIGHTS

School of Law Rep, Univ Texas, Apr 1968. 145 p, 230 ref

University of Texas, Austin

DESCRIPTORS--/ cities/ compensation/ ground water/ riparian rights/ laws/ *water rights/ *condemnation/ *eminent domain/ water districts/ preferences (water rights)/ prior appropriation/ Texas/ bibliographies

IDENTIFIERS--/ *appropriative rights/ just compensation/ valuation/ inverse condemnation

R203044X68A R&D PROJECT CONTROL MODEL EXPERIENCE
Traditional research and development (R&D) project cost control systems relate only expenditures with elapsed time, rather than expenditures and achievement with time. Achievement reporting is generally considered separately from cost reporting. A theoretical control model relating cost and achievement with time for R&D projects is developed and described. This model provides: (1) early warnings of impending project failures, (2) more conceptual pinpointing of the forces affecting these impending failures, and (3) detailed analysis of the achievement-per-dollar spent. Controlling by dollars-spent-per-time period potentially yields erroneous conclusions. The results of this study are based on application of the model to chemical development projects and to a representative sample of chemical research projects at the Monsanto Company. The study shows the relationship of these results to the overall development of an integrated planning and control system.

R203044X68A

Souder, William E

EXPERIENCES WITH AN R&D PROJECT CONTROL MODEL

Inst Elec Electron Eng Trans Eng Manage, Vol EM-15, No 1, pp 39-49, Mar 1968. 11 p, 6 fig, 4 tab, 12 ref

Monsanto Co, St Louis, Mo

DESCRIPTORS--/ *research and development/ planning/ administration/ management/ *control/ analysis/ costs/ budgets/ theory/ experimental data/ models/ critical path method/ errors/ operations research/ forecasting/ chemical engineering/ acceptability

IDENTIFIERS-- / comparative studies/ *cost analysis/ management planning/ failures/ evaluation/ expenditures/ cost control

R203065 68A ENGINEERS CAN COMMUNICATE WITH MANAGERS
For an idea to be truly effective, it must be communicated effectively. By improving his communication with management, the engineer can gain recognition, a better feeling of his standing, more interesting assignments, and increased pay and advancement. He can overcome the physical, intellectual, background, and psychological barriers to effective communication by applying 3 basic principles. When applying these principles he should think carefully about his objective and audience and then: (1) Select. The listener will understand and retain most if not more than 3 to 5 major points are presented. Arrange suggested points in decreasing order of contribution to accomplishment of the objective and use only the most significant. (2) Simplify. Adapt the points to the receiver's language and other capabilities, bearing in mind his interests, his attitudes, and his needs. Do not overwhelm him with technical jargon. Most managers are more interested in conclusions and recommendations than in the details of the problem solution. (3) Specify. Use relevant, concrete evidence and examples that the receiver can understand and relate to his own experience. Give him only what he needs to evaluate your message.

R203065 68A

Robinson, Joseph A

HOW ENGINEERS CAN COMMUNICATE MORE EFFECTIVELY WITH MANAGERS

Inst Elec Electron Eng Spectrum, Vol 5, No 6, pp 47-51, June 1968. 5 p

Joseph A Robinson Associates, San Francisco, Calif

DESCRIPTORS--/ *communications/ management/ *engineering personnel/ *scientific personnel/ personnel/ efficiencies/ administration/ applied psychology/ employee relations/ feedback/ preparation/ human behavior/ *employees

IDENTIFIERS--/ ideas/ clarity/ listening/ *conversations/ attention

R203066X68A FLOYD DOMINY OF BUREC AND THE ENGINEER
For 8 yr Floyd Dominy has headed the Bureau of Reclamation, a Federal agency that spends over $300 million annually on construction and operations. He has held this position under several Secretaries of the Interior and constantly changing powerful Congressional committees. As a tribute to him and his accomplishments, he is an affiliate of ASCE although his degree is in agricultural economics. The Bureau has spread its knowledge around the free world as a consultant to foreign governments. Controversy exists because the Bureau is doing this work rather than private U S consultants. Dominy argues that Bureau activities are directed and approved by the President and the Congress and private consultants are not always equipped to do the work. U S architectural and engineering firms often receive foreign contracts resulting from preliminary work performed by the Bureau. A list is given of overseas projects involving the Bureau. One of the more comprehensive foreign activities is visible in the extensive training programs for foreign engineers and technicians. In 17 yr over 7000 foreign specialists have spent a few months to several years as part of the Bureau's Denver engineering force.

R203066X68A

Halmos, E E Jr

FLOYD DOMINY OF BUREC AND THE ENGINEER

Worldwide P&I Plann, Vol 2, No 3, pp 58-64, May-June 1968. 7 p, 1 tab, 1 ref

Worldwide P&I Planning, Washington, D C

DESCRIPTORS--/ *engineering personnel/ *engineering services/ training/ management/ scientific organizations/ governments/ *leadership/ foreign projects/ professional personnel/ responsibilities/ foreign countries/ administration/ *foreign activities/ *foreign engineering service/ preliminary investigations/ consulting engineers/ government employees
IDENTIFIERS--/ *Bureau of Reclamation/ Agency for Intl Dvlpmt/ worldwide/ *foreign aid/ *Dominy, Floyd E

R203067 68A HUMAN BEHAVIOR AND EMPLOYEE MOTIVATION
Some major ideas discovered about motivational processes as they appear in industry are summarized. Six general principles resulting from the study of motivation are: (1) Motivation is psychological, not logical. (2) Motivation is fundamentally an unconscious process. (3) Motivation is an individual matter. (4) Motivating needs differ from person to person and vary from time to time. (5) Motivation inevitably is a social process. (6) The majority of our daily actions is guided by habits established by motivational processes that have been active for many years. A supervisor should look at 7 aspects of each person and consider them together to get the total picture of the individual. These 7 areas are intellectual efficiency, personality, social characteristics, self-insight, insight into others, performance, and character. A supervisor also should understand the psychological needs of an employee and know how to use them as incentives for guidance. Four psychological needs discussed are self-realization, recognition, security, and social experience.

R203067 68A

Miller, Mungo

UNDERSTANDING HUMAN BEHAVIOR AND EMPLOYEE MOTIVATION

Advance Manage J, Vol 33, No 2, pp 47-52, Apr 1968. 6 p

Affiliated Psychological Services, Milwaukee, Wis

DESCRIPTORS--/ *human behavior/ *motivation/ management/ compensation/ supervision/ *personnel management/ employees/ employee relations/ psychology/ applied psychology/ human engineering/ personnel/ incentive awards/ administration/ behavior (psychology)

IDENTIFIERS--/personality/ productivity/ goals/ performance/ ability

R203085X68A SLOWLY WE MOVE TOWARD THE METRIC
Thomas Jefferson proposed to the Congress in 1790 that the U S adopt a decimal system based on metric measurements. A bill was introduced in 1967 to study the possible switchover to the metric system. Eighty-two nations use the metric system; the U S, Canada, Australia, and South Africa are the only major industrial nations clinging to British measurements. Great Britain is converting, with 1975 as the completion date. Japan has completed the conversion with a net gain, after a 6-yr changeover period. Many major U S export companies use dual units of measurement, a duplication that the metric system could eliminate. Positive steps have been taken in converting to the system, despite opposition from industrialists, engineers, and businessmen. Drug manufacturers have changed over and find that economic advantages outweigh difficulties. Leadership for making the changeover must come from engineers and educators. Industry should start an immediate educational and research program to familiarize all engineers and technicians with the advantages of the system, and educational institutions should use the system in instruction. We must act now before we are isolated from the rest of the world.

R203085X68A

Nasser, George D

SLOWLY WE MOVE TOWARD THE METRIC

Consult Eng, Vol 30, No 6, 115-117, June 1968. 3 p

American Concrete Institute Journal, Detroit, Mich

DESCRIPTORS--/ *conversion/ *measurement/ scientific personnel/ weight/ technical societies/ foreign countries/ education/ industries/ costs/ economics/ engineering personnel/ engineering education/ specifications/ scientific organizations/ *standards/ manufacturing/ industrial engineering/ measuring instruments/ management/ mechanical engineering
IDENTIFIERS--/ *metric system/ world trade/ English measurement system

R203086X68A PATENT POLICY
Government patent policy is one of the most troubled issues of the government-industry partnership. Government agencies and departments have a variety of approaches to the control of technology developed through the partnership, resulting in a variety of consequences involving property rights and commercial value. Diversity in patent policy is due principally to the unique internal dynamics and history of the semi-autonomous administrative subsystems involved in the partnership. Patent policies of several governmental agencies are discussed. Has 20 references.

R203086X68A

Lambright, W Henry

GOVERNMENT, INDUSTRY, AND THE RESEARCH PARTNERSHIP: THE CASE OF PATENT POLICY

Public Admin Rev, Vol 28, No 3, pp 214-221, May-June 1968. 8 p, 20 ref

Syracuse University, New York, N Y

DESCRIPTORS--/ *patents/ *policy matters/ industries/ bibliographies/ management/ laws/ *creativity/ *inventions/ research and development/ manufacturing/ liabilities/ compensation/ administration/ technology/ benefits/ economics

IDENTIFIERS--/ *patent law/ ideas/ incentives/ profits/ ownership/ *licenses/ public benefits/ federal government

R203088X68A MANAGING SCIENTIFIC CREATIVITY
The major challenge of the industrial research director is to manage a truly creative short- and long-term effort that meets the test of profitability. The scientist-manager must become involved in a series of personal relationships affecting performance of a group and the creative individuals in the group. After recognizing the creative scientist in the job interview (10 distinguishing characteristics are given), the manager must motivate him to productive creativity without favoritism. Suggestions for guiding a creative employee include: (1) gearing pressures to goals, (2) maintaining two-way communication, (3) appraising his efforts, (4) defending him against attack, (5) giving his subconscious time and opportunity to resolve problems, (6) building his sense of security, (7) tolerating his radical unworkable ideas without harsh judgment, (8) respecting his stimulation sources, (9) providing special direction, (10) providing a creative environment, (11) recognizing creativity, (12) selecting not a totally creative employee but one who can create and also sell his creation, (13) evaluating creative ideas and suggestions quickly, and (14) overlooking harmless foibles that may be critical to creative functioning. Has 18 references.

R203088X68A

Feinberg, M R

FOURTEEN SUGGESTIONS FOR MANAGING SCIENTIFIC CREATIVITY

Res Manage, Vol 11, No 2, pp 83-92, Mar 1968. 10 p, 18 ref

City University of New York, N Y

DESCRIPTORS--/ *creativity/ management/ *motivation/ supervision/ time/ *scientific personnel/ *personnel management/ environment/ research and development/ reasoning/ psychology/ behavior (psychology)/ inventions/ employee relations/ communications/ efficiencies/ standards/ values/ human behavior/ bibliographies
IDENTIFIERS--/ executives/ performance rating/ ideas/ innovation/ goals/ evaluation

R203057 68A CROPPING EFFECT ON SOIL AND IRRIGATION
A study was made to test the hypothesis that cropping treatment affects the water available for plant growth, thereby affecting the need for irrigation during periods without rainfall. Irrigation requirements during the May-August season were investigated relative to some physical properties of Cecil sandy loam as affected by 8 cropping systems ranging from corn grown continuously with stalks removed to grass or alfalfa sod. The cropping systems had no effect on particle size distribution and total porosity, but crust strength decreased and aggregate stability and infiltration rates increased as the quantity of plant material returned to the soil was increased. The increased water intake was offset by increased deep drainage from the root zone, resulting in no change in subsequent irrigation requirements.

R203057 68A

Carreker, John R; Bertrand, Anson R; Elkins, Charles B Jr; et al

EFFECT OF CROPPING SYSTEMS ON SOIL PHYSICAL PROPERTIES AND IRRIGATION REQUIREMENTS

Agron J, Vol 60, No 3, pp 299-302, May-June 1968. 4 p, 3 fig, 5 tab, 10 ref

University of Georgia, Athens; Agricultural Research Service, Baton Rouge, La

DESCRIPTORS--/ *crops/ *soil physical properties/ irrigation O&M/ irrigation/ *water requirements/ agriculture/ infiltration/ percolation/ rainfall/ plant (botany)/ runoff/ soil moisture/ penetrometers

IDENTIFIERS--/ *corn (field)/ sandy loams/ soil-water-plant relations/ plant growth/ root zone/ cropping patterns

R203071X68A EVAPOTRANSPIRATION FROM SOIL COLUMN
Numerical analysis was applied to the steady-state flow equation for evapotranspiration from a vertical soil column. Water uptake by plant roots was incorporated into the flow equation as a negative source term. Evapotranspiration rate and partitioning between plant transpiration and soil evaporation were specified as the top boundary condition; the lower boundary condition was a water table. Results of analysis of a Pachappa sandy loam gave pressure head, water content, source strength, and soil water flux profiles. The study (1) demonstrated that the flow equation with a source term can be solved by numerical means, (2) showed the theoretical influence of parameters in the source term model on flow in soil, (3) indicated qualitatively a water transfer from wet soil through the root system, and (4) indicated that the source term has little effect on the pressure head profile unless the evapotranspiration rate is of the same magnitude as the theoretical limiting value.

R203071X68A

Whisler, F D; Klute, A; Millington, R J

ANALYSIS OF STEADY-STATE EVAPOTRANSPIRATION FROM A SOIL COLUMN

Soil Sci Soc Amer Proc, Vol 32, No 2, pp 167-174, Mar-Apr 1968. 8 p, 13 fig, 12 ref

University of Illinois, Urbana

DESCRIPTORS--/ *evapotranspiration/ numerical method/ *plant (botany)/ soils/ soil science/ *steady flow/ soil moisture/ water table/ analysis/ mathematical analysis/ water pressures

IDENTIFIERS--/ *soil columns/ soil moisture movement/ root zone/ sandy loams/ soil water movement/ root systems/ mathematical models

R203115 68A SOIL MOISTURE AND FOOD PRODUCTION
Some of the benefits which accrue if fuller use is made of available soil moisture have been shown in South Africa. Land benefiting from irrigation comprises only 1 million morgen (a unit of land measurement equal to 2.116 acres) of a 143 million morgen total land area. Therefore, emphasis is placed on utilizing drier lands which comprise 11 million morgen to their full potential. Factors considered are water requirements of plants, control of water used by weeds, moisture distribution in soil and methods to increase moisture content, seedbed preparation methods avoiding unnecessary evaporation and erosion, time of planting and root development. Increased management of the veld is recommended to slow down runoff rate and increase degree of water penetration through fertilization and increased vegetation.

R203115 68A

Hyam, G F S

SOIL MOISTURE AND FOOD PRODUCTION

African J Sci, Vol 64, No 1, pp 13-19, Jan 1968. 7 p, 4 tab, 14 ref

African Explosives and Chemical Industries, Ltd, Northrand, Transvaal

DESCRIPTORS--/ *soil moisture/ weed control/ evaporation/ erosion/ moisture content/ soil management/ dry land farming/ crops/ seeding/ erosion control/ planting management/ arable land/ grasslands/ *dry farming/ food and cover crops/ root zone/ *South Africa

IDENTIFIERS--/ veld

R203139X67A SALT WATER AGRICULTURE
Irrigation with salt water holds some promise of turning sandy soils of many arid lands into productive areas. Principles of salt water irrigation figured in the success of the Desert Garden of Eilat in the Negev Desert in 1949 where some 180 species of non-halophytic plants were grown. Tolerance experiments followed with four types of seawater; Caspian, North Sea, Red Sea or Mediterranean, and an oceanic conentration containing between a 3 and 4% total of dissolved solids. Ten species of plants were used. Four survived oceanic-type irrigation and six survived the Caspian Sea-type. The principles working in such experiments with salt water and sandy soils included the following: Salt did not accumulate in a well-percolated soil thus rinsing through sodium chloride and leaving well-aerated roots. Newer principles included partial root contact, subterranean dew, viscosity principle, and ionic balance between the living system and salt water.

R203139X67A

Boyko, Hugo

SALT-WATER AGRICULTURE

Sci Amer, Vol 216, No 3, pp 89-96, Mar 1967. 7 p, 6 fig

World Academy of Arts and Sciences; Israel Ministry Agriculture, Rehovot

DESCRIPTORS--/ *saline water/ sands/ *sea water/ dissolved solids/ percolation/ *sodium chloride/ aeration/ *ions/ biodegradation/ soil-water-plant relationships/ viscosity/ gravels/ root systems/ brackish water/ *irrigation practices/ deslination processes/ electrolytes

IDENTIFIERS--/ *subterranean dew/ *saline agriculture/ Negev, Israel

R203231X68A EFFECT OF GRAZING ON INFILTRATION, WESTERN COLORADO
Infiltration, runoff, and erosion were measured from test plots on both grazed and ungrazed areas in the Badger Wash area in western Colorado. The area, at an altitude of about 5,000 ft, has sparse desert-type vegetation and shallow soil largely derived from weathered Mancos shale bedrock. During tests made in 1953-54, 1958, and 1963, rainfall at 5-in./hr was applied artificially to each 2.5 sq-ft plot for a 50-min period. The infiltration rate, measured during the last 20 min of the test, was about .15 in./hr greater for grazed than ungrazed areas, but erosion was about 18% higher on grazed areas. Infiltration rate in 1963 was only about 3/4 that for 1958 in both areas although bulk density and penetrometer tests showed the soil was less compacted in 1963. It is suggested that the reduced infiltration might result from less than normal frost shrink-swell in the winter preceding 1963 and in surface compaction from above-normal summer thunderstorms. If the surface soil could be held in optimum condition, perhaps by use of wetting agents or by controlled soil cracking, normal storm rainfall of .25 to .50 in. might be held where it falls. Additional investigations in the Badger Wash area seem to be warranted.

R203231X68A

Thompson, J R

EFFECT OF GRAZING ON INFILTRATION IN A WESTERN WATERSHED

J Soil Water Conserv, Vol 23, No 2, pp 63-65, Mar-Apr 1968. 3 p, 4 fig, 1 tab, 5 ref

Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo

DESCRIPTORS--/ *infiltration/ water conservation/ *soil moisture/ soil texture/ *erosion/ *soil management/ grazing land/ deserts/ Colorado/ permeability/ percolation/ *watershed management/ infiltrometers/ bulk density/ rainfall-runoff relationships/ compacted soils/ desert plants/ *grazing/ induced infiltration/ soil properties
IDENTIFIERS--/ *infiltration rate

R203235 68A LAND USE AND CHEMICAL CHARACTERISTICS OF LAKES
Conductance values of water from 71 Florida lakes in similar geologic and climatalogic settings showed a log-normal distribution with fair correlation between quality of the water and land-use practices in the lake basins. The specific conductance values ranged from 40 to 550 micromhos. Physical features, such as size of the lake and drainage area and the presence of inlets and outlets, appear to have no determinable effect on the quality of lake water. Water quality variation among the lakes is due primarily to land-use practices. Higher conductivity measured in some lakes is probably due to sulfates which result from application of wettable sulfur to nearby citrus groves. Concentrations of dissolved minerals will increase in a nonleaky closed lake until the water is saline. The presence of fresh water in the lakes in this area indicates that the lakes constantly drain to the groundwater reservoir. Study was made to learn of physical and chemical characteristics of lakes, to correlate certain parameters, and to determine whether the data obtained can be used to define the hydrologic relation between lakes and groundwater.

R203235 68A

Pfischner, F L, Jr

RELATION BEWTEEN LAND USE AND CHEMICAL CHARACTERISTICS OF LAKES IN SOUTHWESTERN ORANGE COUNTY, FLORIDA

Geol Surv Prof Pap 600B, pp B190-B194, 1968. 5 p, 6 fig, 1 ref

Geological Survey, Ocala, Fla

DESCRIPTORS--/ limnology/ chemical analysis/ groundwater recharge/ *land use/ sampling/ *infiltration/ chemical properties/ aquatic environment/ fresh water/ *lakes/ *hydrologic aspects/ conductivity/ citrus fruits/ Florida/ *water chemistry

IDENTIFIERS--/ Orlando, Fla/ leaky aquifers

R203240X68A EFFECTS OF PASTURE MANAGEMENT ON RUNOFF, NEBRASKA
Field experiments during 1939-61 at the Central Great Plains experimental watershed near Hastings, Nebraska, were used to determine the effect of contour furrowing, disking, and grazing management on soil-water storage and forage production. Eight plots were established in 2 pastures having deep silt-loam soil and slopes of about 6%. Furrows were dug with 1-ft vertical spacing on 4 plots, and 1/2 the furrowed and unfurrowed plots were fenced so they could be lightly grazed. After 7 years, more closely spaced furrows were dug on 2 furrowed plots, and 2 of the unfurrowed plots were disked with an eccentric disk. At that time all the plots were seeded with a smooth bromegrass-legume mixture. Furrowing, disking, and light grazing all reduced runoff compared to the untreated heavily grazed plots. Runoff from the contour furrowed plots was only about 20% of that from untreated plots, and was also less than on the disked and lightly grazed plots. The increase in soil water from the various treatment measures did not produce better stands of grass; reseeding and fertilizing were needed to improve grass production. Soil-moisture profiles through the plots suggest that infiltration from the furrows may increase groundwater recharge, but that factor was not evaluated.

R203240X68A

Dragoun, F J and Kuhlman, A R

EFFECTS OF PASTURE MANAGEMENT PRACTICES ON RUNOFF

J Soil Water Conserv, Vol 23, No 2, pp 55-57, Mar/Apr 1968. 3 p, 3 fig, 2 tab, 2 ref

Agricultural Research Service, Hastings, Nebr and Newell, S Dak

DESCRIPTORS--/ *soil moisture/ *water conservation/ *pasture management/ water utilization/ land management/ *runoff/ grazing land/ Great Plains/ *range management/ watershed management/ Nebraska/ induced infiltration/ *grasslands/ water management (applied)/ forage grasses/ contour furrows

IDENTIFIERS--/ forages/ *soil water storage/ grazing/ pastures

R203278X68A NATURAL EVAPORATION AND ENERGY BALANCE
Natural evaporation from agricultural land is evaluated hourly for 29 months near Kristianstad, Sweden. A bulk aerodynamical method is employed with stability dependent coefficient. Key parameters are wind speed at 12 m above ground and temperature and humidity at 1.5 and 12 m. Measurements are representative of areas extending 1 km upwind. Accuracy of values become more significant as averaging time increases. Examples of series of hourly, daily, and monthly values are presented and discussed in terms of influences of different weather elements. Monthly values of potential evaportranspiration are derived with Thornthwaite and Penman formulae. Actual mean evaporation in spring and early summer is one-half that obtained with the Penman formula but almost equal to Thornthwaite values. In late summer and fall Penman values are 1.3 times the actual, but Thornthwaite values are double. Actual evaporation in late fall and winter is greater than formulae values. A seasonal energy balance of the surface shows that nearly equal amounts of net radiation goes to evaporation and to heating the atmosphere in spring and early summer. In late summer progressively more net radiation energy goes to evaporation. In winter large amounts of atmospheric heat accounts for local radiational loss and for evaporation.

R203278X68A

Hogstrom, Ulf

STUDIES OF THE NATURAL EVAPORATION AND ENERGY BALANCE

Tellus, Vol 20, No 1, pp 65-75, 1968. 11 p, 9 fig, 8 ref

University of Uppsala, Sweden

DESCRIPTORS--/ humidity/ temperature/ kinetics/ instrumentation/ *energy balance/ moisture/ *evaporation/ evapotranspiration/ radiation/ water vapor/ *energy budget/ air ciruculation/ vapor pressure/ environmental effects/ *air-earth interfaces/ precipitation (atmospheric)/ wind velocity
IDENTIFIERS--/ *natural evaporation/ *potential evapotranspiration/ Sweden/ Penman method/ Penman equation/ Thornthwaite method

R203119X67A FRESH WATER JELLYFISH--LAKE MEAD, NEVADA
The fresh water jellyfish, Craspedacusta sowerbyi Lankester, appeared in Lake Mead, Nevada in 1962-1963. Observations and collections of medusae were made at approximate 1-week intervals from Oct 25, 1962 to Jan 25, 1963. Divers at selected locations rose from the bottom and counted the jellyfish in an 18-in. hoop at measured vertical distances. It was found the population was concentrated in deeper water in the morning and vertical distribution became more uniform by midday. Surface numbers were low at night and increased rapidly when the sunlight hit the water. This attraction to light was distinct from stimulation to activity by light as shown from laboratory experiments. It was also shown the female population greatly exceeded the male population. Above-average temperature and elevated water level were attributed to the appearance of the jellyfish. When water temperatures fell below 60 deg F a complete absence of males was evident, and the population declines until it disappeared in Jan 1963.

R203119X67A

Deacon, James E and Haskell, W L

OBSERVATIONS ON THE ECOLOGY OF THE FRESHWATER JELLYFISH IN LAKE MEAD, NEVADA

Amer Midland Natur, Vol 78, No 1, pp 155-166, July 1967. 12 p, 3 fig, 4 tab, 13 ref

Desert Research Institute, Las Vegas, Nev

DESCRIPTORS--/ aquatic animals/ *jelly fish/ invertebrates/ water level fluctuations/ water temperature/ distribution patterns/ environmental gradient/ *photoperiodism/ vertical migration/ aquatic life/ *aquatic environment

IDENTIFIERS--/ *Lake Mead

R203227 68A DETERMINING BROMINE IN BRINE WITH X-RAY FLUORESCENCE
The method of determining bromine in brines by using X-ray fluorescence is described and the results are compared with those obtained by the oxidation method. Total bromine is determined directly by measuring the peak-to-background intensity ratio of the bromine K-alpha radiation. In testing the method, 12 synthetic standards were prepared by adding known amounts of bromine to a stock solution of density 1.210 g/ml, 12 additional samples were prepared and adjusted to a density of 1.064 g/ml, and 13 of the samples were analyzed by both the X-ray fluorescence and oxidation methods and the results are compared in a table. The accuracy of the determinations is not affected by the wide differences in the density and composition of the samples. Samples containing 1 to 1000 ppm bromine may be analyzed in about 1 minute with an accuracy comparable to that usually obtained by chemical methods.

R203227 68A

Dunton, Polly J

DETERMINATION OF TOTAL BROMINE IN BRINES BY X-RAY FLUORESCENCE

Appl Spectrosc, Vol 22, No 2, pp 99-100, Mar-Apr 1968. 2 p, 3 tab, 7 ref

Geological Survey, Denver, Colo

DESCRIPTORS--/ water quality/ chemical analysis/ technology/ *brines/ density/ water analysis/ *analytical techniques/ *X-ray fluorescence/ *water chemistry/ elements (chemical)/ mineral water/ halogens

IDENTIFIERS--/ *bromine/ oxidation method/ *dissolved minerals

R203051X68A SUBSIDENCE EFFECTS ON CALIFORNIA AQUEDUCT
Subsidence will affect 200 mi of the 295-mi California Aqueduct located along the foothills of the east slope of the Coast Mountain Range and west side of the San Joaquin Valley. The subsidence is the result of (1) compaction of artesian aquifers (deep subsidence), (2) collapsing of soil structure (shallow subsidence), and (3) consolidation of foundations, and can be separated into 2 general classifications: one affects a large area and continues over a long period of time; the other affects a small area and occurs rapidly. Maps are included showing the location of the California Aqueduct relative to the subsidence areas. Shallow and deep subsidence were considered in the design, in addition to normal consolidation of foundations. The affect of deep subsidence on alinement selection and design for canal freeboard, cracking of canal lining, hydrocompaction, and construction scheduling are discussed.

R203051X68A

Lucas, Clifford V

DESIGN OF THE CALIFORNIA AQUEDUCT FOR EFFECTS OF SUBSIDENCE

Proc, Western Water Power Symp, pp A-1-A-9, Apr 1968. 9 p, 12 fig

California State Department of Water Resources, Sacramento

DESCRIPTORS--/ *aqueducts/ *land subsidence/ geology/ canal embankments/ *canal design/ canal linings/ consolidation/ hydraulic structures/ cost comparisons/ economics/ maintenance/ cracking/ freeboard/ foundations/ design criteria/ canal seepage/ aquifers/ hydraulic gradients/ geomorphology/ engineering geology/ settlement
IDENTIFIERS-- / *California Aqueduct/ California/ *hydrocompaction/ site selection/ *subsidence/ *shallow subsidence/ *deep subsidence

R203081 68A TUNNELING EQUIPMENT
A survey is given of recent developments of machine excavation of underground caverns. Great progress has been made toward fully-mechanized, continuous, and true-to-profile excavation. True-to-profile blasting with minor vibrations has been developed so extensively that the profile line can be maintained dependably and economically. Durability of various tunneling machines opens promising application prospects for rock cavern construction. Rock boring techniques have reached perfection in loosening tools and have made possible mechanical sinking of small-diameter shafts. Shield tunneling machines are available for fully-mechanized excavation of underground caverns and can be used sucessfully in hydraulic operations, in cuttable stable soils and soft rock, and in unstable soils with water penetration. Techniques and equipment used in underground excavation are illustrated. Contains 63 references.

R203081 68A

Linder, Richard

THE FULLY MECHANIZED, CONTINUOUS, TRUE-PROFILE EXCAVATION OF UNDERGROUND CAVERNS

Der Bauingenieur, Vol 42, No 4, pp 124-137, 1967. Transl from Ger, Joint Publ Res Serv Transl 737, June 1968. 47 p, 42 fig, 5 tab, 63 ref

DESCRIPTORS--/ *tunneling/ *tunneling machines/ underground structures/ *tunnel construction/ tunnels/ bibliographies/ excavation/ explosives/ mining/ blasts/ shafts (mining)/ rocks/ foreign construction/ boreholes/ construction/ boring machines/ cutting/ abrasion/ engineering geology/ drills/ drilling equipment/ drilling/ rock excavation
IDENTIFIERS--/ Germany/ smooth wall blasting/ blasting

R203082 68A STRESS IN BURIED POLYESTER PIPE

Stress-strain conditions in subterranean, glass-fiber-reinforced polyester resin pipes were investigated. Experimental procedure and apparatus are discussed. Pipe deformations were measured with telescopic sliding calipers, and circumferential stresses were measured with elongation measuring strips. The investigation indicated that moments calculated using Spangler's theory are too high in pipes of low rigidity such as polyester pipe. Test results showed that: (1) moments at the pipe crown from filler above the pipe are directly dependent on pipe rigidity and change in vertical diameter, (2) deformation and moments in the pipe are reduced by increasing the density of lateral material, (3) vertical load due to the earth above a polyester pipe is less than the load of the earth column above the pipe, (4) moments in the pipe are negligible when laid in sandy gravel, and (5) pipes with partial reinforcement can be used under certain circumstances. Specifying maximum deformations will keep pipe moments to an acceptable value. Danger of denting the pipe wall is the controlling factor for determining wall thickness.

R203082 68A

Carlstrom, Borge and Molin, Jan

STRESS CONDITIONS IN SUBTERRANEAN, GLASS-FIBER-REINFORCED POLYESTER RESIN PIPES

Kunstst, Vol 56, No 12, pp 895-898, 1966. Transl from Ger, Joint Publ Res Serv Transl 748, Jan 1968. 12 p, 12 fig, 3 tab

DESCRIPTORS--/ stress/ *stress analysis/ *pipes/ bending moments/ test procedures/ deformation/ earth pressures/ compressive strength/ ground water/ elasticity modulus/ rigidity/ mathematical analysis/ *plastics/ lateral forces/ soil mechanics/ flexible tubing

IDENTIFIERS--/ *buried pipes/ *polyesters/ foreign research/ *buried tubes/ *glass reinforced plastics

R203097 68A SHOTCRETE AS TUNNEL SUPPORT AND LINING

The first major tunnel in North America using coarse aggregate (plus 1/2 in.) shotcrete for primary support and lining is being completed under an industrial and residential area in Vancouver. The 10,760-ft-long tunnel has a cross section of 29 x 20 ft. Except for 1400 ft in impervious tills, the tunnel passes through a very young series of flat-lying sedimentary beds so unconsolidated that they fall apart on exposure. Specified shotcrete support was 6 in. in the arch and 4 in. in the walls and cost approximately $100 per linear ft. Another $10-$12 per ft was required to finalize the support as a lining. Estimated cost for a conventional steel support system with a concrete lining was $400 per linear ft. Using accelerating admixtures enables shotcrete to set quickly enough to adhere to wet and running water surfaces; 75-80% of the 28-day compressive strengths was reached in 48 hr. Details are given of excavation and lining of the tunnel.

R203097 68A

Mason, E E

THE FUNCTION OF SHOTCRETE IN SUPPORT AND LINING OF THE VANCOUVER RR TUNNEL

Dolmage, Mason and Stewart Ltd Pap, 1968. 18 p, 7 fig

Dolmage, Mason and Stewart Ltd, Vancouver, British Columbia, Canada

DESCRIPTORS--/ *shotcrete/ *tunnel linings/ *tunnels/ rock excavation/ steel linings/ tunnel construction/ admixtures/ compressive strength/ construction/ foreign construction/ setting (materials)/ radial stress/ concrete/ aggregates/ concrete placing/ instrumentation/ supports/ *gunite
IDENTIFIERS--/ *tunnel supports/ Canada/ pressure cells

CIVIL ENGINEERING (GENERAL)

R203259 67A DERIVATION OF RESERVOIR OPERATING RULES
The purpose of this study was to develop a methodology for determining an optimum set of reservoir operating rules specifying monthly allocation of storage space based on the example of Rough River Reservoir, and assuming this multipurpose reservoir provides flood control, water supply, and recreation. Operating rules were derived by the method of marginal analysis using as criteria, achievement of maximum net benefits from available storage capacity. Benefit relationships were derived for each use. Variation of flood control benefits with available flood storage was determined from Corps of Engineers stage-damage curves and statistical analysis of historical storms in the area. Variation of water supply yield within the reservoir was determined by using statistical properties of past streamflow to synthesize month-by-month operation of the reservoir. Recreation benefits were determined for 5 levels of annual visitation (twice the present value) by subdividing use among 3 activity types and estimating how each type would be affected by fluctuation of water level. The 3 benefit curves were combined by the method of marginal analysis, and derived operating rules were expressed as curves which vary with marginal value of an acre-foot of water for water supply. Has 21 references.

R203259 67A

Dowell, Charles O

DERIVATION OF RESERVOIR OPERATING RULES BY ECONOMIC ANALYSIS

Water Resour Inst Res Rep 6, Univ Kentucky, 1967. 116 p, 24 fig, 20 tab, 21 ref

University of Kentucky, Lexington

DESCRIPTORS--/ flood peaks/ *flood routing/ runoff coefficients/ cost-benefit analysis/ *flood control/ bibliographies/ *reservoir operation/ economics/ methodology/ operation and maintenance/ recreation/ storage capacity/ *economic feasibility/ economic efficiency/ reservoir storage/ water management (applied)/ recreation facilities
IDENTIFIERS--/ *Rough River Reservoir, Ky

DAMS AND HYDRAULIC STRUCTURES

R203052X68A INCREASED HEIGHTS OF MODERN DAMS
Changes in the state of the art of design and construction of earth and rock embankments are discussed and the effect of these changes on dam heights considered feasible in recent years. Engineers now are able to design and construct large dams considered beyond their capabilities 20 years ago. The trend toward earth and rock dams of ever increasing height has become readily apparent in this country since the 1940's. Dams 300- to 400-ft high now are quite commonplace, and since 1945 such dams as Round Butte, Mud Mountain, Anderson Ranch, and Union Valley have been constructed in the 400- to 500-ft range; Cougar, Swift, and Trinity in the 500- to 600-ft range; and Oroville in the 700- to 800-ft range. Many influencing factors have made this progress possible. Some of the advances reviewed are: (1) theory, (2) exploration techniques, (3) materials testing, (4) design techniques, (5) specification concepts, (6) materials handling, (7) construction equipment, and (8) instrumentation. Two large California Department of Water Resources dams, Oroville and Castaic, are discussed. Has 15 references.

R203052X68A

Gordon, Bernard B and Wulff, Jack G

THE EFFECTS OF CHANGES IN THE STATE OF THE ART ON HEIGHTS OF EARTH AND ROCK DAMS-OROVILLE AND CASTAIC DAMS

Proc, Western Water and Power Symp, pp A-97-A-110, Apr 1968. 14 p, 4 fig, 2 tab, 15 ref

California State Department of Water Resources, Sacramento

DESCRIPTORS--/ *dam design/ *earth dams/ *dams/ reviews/ rock fills/ embankments/ soil mechanics/ foundations/ foundation investigations/ geologic investigations/ materials testing/ piezometers/ shear/ dam foundations/ seismic design/ instrumentation/ bibliographies/ strain gages/ earth handling equipment/ construction/ *rockfill dams
IDENTIFIERS-- / *Oroville Dam, Calif/ *Castaic Dam, Calif/ *height/ stress meters

R203053X68A MEASURING PORE PRESSURE & SEISMIC EFFECTS
Oroville, Del Valle, and Castaic Dams of the California State Water Project are being instrumented intensively to determine behavior during construction and operation. Instrumentation for measuring pore pressures and seismic effects is discussed. Pore pressure instruments include hydraulic, pneumatic, electric, and porous tube piezometers. Dynamic stress cells, hydrodynamic pore pressure cells, and accelerometers were installed to study behavior of the dams during earthquakes. The instruments, installations, special problems encountered, and some interim results are discussed. Knowledge of embankment behavior revealed by these instruments will define critical areas for more intensive investigation in future dams, and areas where instruments may be placed in lower concentrations. Only electrical seismic monitoring systems can operate successfully, and despite the expense, such systems are justified on large dams in seismically active areas.

R203053X68A

Perry, Charles W and Kruse, George H

INSTRUMENTATION FOR PORE PRESSURES AND SEISMIC EFFECTS--STATE WATER PROJECT DAMS

Proc, Western Water Power Symp, pp A-153-A-174, Apr 1968. 22 p, 16 fig, 13 ref

California State Department of Water Resources, Sacramento

DESCRIPTORS--/ *earth dams/ *embankments/ *pore pressures/ pore water pressures/ soil mechanics/ dam design/ instrumentation/ accelerometers/ porous tube piezometers/ *piezometers/ earthquakes/ *seismic design/ measuring instruments

IDENTIFIERS--/ Oroville Dam, Calif/ Del Valle Dam, Calif/ Castaic Dam, Calif/ dam stability/ *earthquake loads/ *seismic stability

R203059 68A DESIGN AND ANALYSIS OF ARCH DAMS
Twelve papers presented at this symposium show the advances made in the last 10 yr by British universities in developing methods for designing arch dams. The design methods can be applied to much broader fields. Five idealized arch dam profiles were selected for study, ranging from a rectangular profile with a constant radius to a doubly curved arch with a thin crest and a thicker base. The different types of dams are analyzed and compared by mathematical calculations and model studies. Heights of the dams were specified as 30 m for the simplest type of arch and 120 m for the other 4 types. A standard symmetrical valley was selected to guarantee uniform foundation conditions throughout the comparisons. Limited variations in temperature stress conditions were considered. Eleven papers discuss various aspects of design and analysis including: (1) dynamic analysis, (2) use of finite elements, (3) model techniques, and (4) computer methods; the final paper is a critical comparison of results obtained by these methods. Has 112 references.

R203059 68A

Rydzewski, J R; Zienkiewicz, O C; Dungar, R; et al

SYMPOSIUM ON ARCH DAMS--A REVIEW OF BRITISH RESEARCH AND DEVELOPMENT

Symp Arch Dams, Inst Civil Eng, Pap 1-12, Mar 1968. 102 p, 159 fig, 29 tab, 112 ref, 9 append

University of Southampton; University of Wales; University of Bristol, all Great Britain

DESCRIPTORS--/ *arch dams/ *concrete dams/ dams/ *structural analysis/ computer programming/ bibliographies/ *dam design/ model tests/ stress/ shell structures/ dam foundations/ models/ dynamics/ three-dimensional/ mathematical analysis/ seismic design/ static tests/ numerical method/ strain

IDENTIFIERS--/ *finite element method/ foreign research/ dynamic loads/ Great Britain/ design practices/ *dynamic relaxation

R203079X68A FLEXIBLE MEMBRANE LINERS
Asphalt membranes, plastic films, and elastomeric sheets provide effective water barriers as linings in canals and reservoirs. Most linings must be covered for protection against weathering and mechanical damage; however, butyl, ethylene-propylene terpolymer, and a modified polyethylene film are satisfactory for exposed linings. The susceptibility of asphalt membranes to piercing from plant roots and shoots makes use of a soil sterilant on subgrades necessary when asphalt membranes are used. Stream velocity in canals with buried membrane linings should not exceed 3 fps. A gravel topping may be necessary to prevent movement of cover material. Side slopes must be flat enough to prevent the cover from slipping; the maximum slope is 3:1, although a slope of 2-1/2:1 is adequate under some conditions. More restrictive applications govern catchment liners and rain trap storage bags. Butyl rubber is the only membrane tested exhibiting good service.

R203079X68A

Lauritzen, C W

FLEXIBLE MEMBRANES FOR WATER APPLICATIONS

World Irrig, Vol 18, No 3, pp 16-22, Apr 1968. 7 p, 17 fig, 13 ref

Agricultural Research Service, Logan, Utah

DESCRIPTORS--/ *buried membranes/ *linings/ *canal linings/ membranes/ reservoirs/ *flexible linings/ lower cost canal linings/ elastomers/ impervious membranes/ subgrade/ rubber/ polyethylenes/ vinyl plastics/ plastics/ asphalt/ sheeting/ films/ seepage

IDENTIFIERS--/ catchments/ butyl rubber/ *seepage control/ asphalt membranes

R203084 68A DESIGN OF TUNNEL LINERS
This paper presents engineering criteria used in designing concrete liners, steel liners, and stiffener rings for the 7-mi-long, 30-ft-dia Angeles Tunnel, near Gorman, Calif. The tunnel design provides a case study for engineers concerned with designing tunnel liners subjected to internal and external pressures. A tunnel liner (1) provides a nearly watertight envelope that minimizes water losses, (2) prevents rockfalls and protects surrounding rock from erosion, and (3) improves hydraulic efficiency. The analysis employs the cracked rock theory to determine the part of the internal pressure taken by the liner. A steel liner was more economical than reinforcing bars because of the magnitude of internal pressure in this tunnel. Steel liners must be designed to withstand external pressure caused by ground water and internal pressure from tunnel operation. Formulae and charts are given to aid liner design. A brief discussion and summary of theories used in steel liner designs for external pressure are presented. The appendix contains a summary of criteria used in Angeles Tunnel design. Has 21 references.

R203084 68A

Ramos, Nestor G and Abrams, Edward A

DESIGN OF TUNNEL LINERS FOR INTERNAL AND EXTERNAL PRESSURE

Calif State Dep Water Resour Tech Memo No 33, Jan 1968. 41 p, 11 fig, 21 ref, append

California State Department of Water Resources, Sacramento

DESCRIPTORS--/ *tunnels/ *tunnel design/ *tunnel linings/ ground water/ concrete/ stiffening/ water pressures/ steel linings/ design criteria/ elastic theory/ design/ water tunnels (conveyance)/ cracking/ grouting/ stress analysis/ absorption/ economics/ bibliographies/ *pressure tunnels
IDENTIFIERS--/ California/ concrete linings

R203100 68A PREFABRICATED REINFORCED CONCRETE DAM
The hydroengineering complex on the Teterev River, USSR, includes a prefabricated reinforced concrete cellular-buttressed spillway dam with a vacuumless-profile haunch and a bottom tubular floodgate 1 m in dia set relatively high in the left abutment. The spillway is 95.6 m long, 18.2 m wide at the base including buttresses, and 25 m high. The dam foundation is fractured granite grouted with cement to a depth of 10 m. Temporary bottom tubular spillways and cofferdams erected from hollow reinforced concrete blocks were used during construction. The dam has a pressure face and buttresses assembled from hollow reinforced concrete blocks coupled to the monolithic spillway face. Rigidity is achieved by joining the buttresses with reinforced concrete slabs. Hollows in the pressure face blocks and joints in the buttress and pressure face blocks are filled with monolithic concrete, forming a solid waterproof concrete wall. Hollows in the buttress blocks and spaces between the blocks are filled with local soil. The construction technique is an improvement and provides savings in time and costs.

R203100 68A

Lerner, V I and Tsarenkov, A V

PREFABRICATED REINFORCED CONCRETE DAM ON THE TETEREV RIVER

Gidrotekh Stroit, No 6, pp 15-20, 1966. Transl from Russ, Joint Publ Res Serv Transl 757, June 1968. 9 p, 7 fig, 3 ref

DESCRIPTORS--/ *buttress dams/ *prefabrication/ dams/ dam foundations/ cutoff walls/ cutoffs/ *concrete dams/ spillways/ *reinforced concrete/ construction/ cellular structures/ hydraulic structures/ construction costs/ foreign construction/ cofferdams

IDENTIFIERS--/ USSR/ construction equipment/ construction methods

R203102 67A FILTRATION AROUND CUTOFF COLLARS
An earth dam model was studied to determine (1) effect of cutoff collars on filtration, (2) range of influence of cutoff collars, and (3) effect of sharp edges of the collars on ambient soil stability. The study indicated that the effect of the collars on the whole filtration regime is negligible because of the relatively small size of individual cutoff collars compared to the region of filtration and may be disregarded. Theoretically, any sharp edge constitutes a potential hazard to soil stability since infinitely great velocities will occur there even when the vertical angle of the edge tends to 180 deg. These extreme velocities never develop in practice because the theoretical mathematical blade never exists. There is little possibility that velocities will develop enough to move soil particles adhering closely to cutoff collars. Since outlet conduits cannot always be built so that soil adheres closely at each point of the body, cutoff collars causing the smallest increase in seepage velocity should be used. The best collars should have a semicircular cross section, but manufacturing difficulties make this impractical. A triangular cross section with rounded vertices or a rectangular cross section with cut edges is acceptable.

R203102 67A

Smolenska, Dobrostawa

THE PROBLEM OF FILTRATION AROUND SEEPRINGS OF BOTTOM CULVERTS IN EARTH DAMS

Rozpr Hydrotech, No 16, pp 131-146, 1965. Transl from Pol, Tech Transl 67-56055, 1967. 19 p, 13 fig, 4 ref

Polish Academy of Sciences, Gdansk, Poland

DESCRIPTORS--/ *filtration/ *seepage/ seepage losses/ *earth dams/ flow nets/ embankments/ *conduits/ *outlets/ *cutoffs/ models/ model tests/ water pressures/ hydraulic models/ *collars/ *outlet works

IDENTIFIERS--/ foreign research/ Poland/ Darcys Law/ flow patterns

R203103 67A SLOPE PROTECTION FOR CANALS & RESERVOIRS
Six types of concrete and stone linings used to protect slopes of waterways in Poland are discussed. Rockfill placed directly on the slopes and supported by a reinforced-concrete sill and timber anchor piles offers several advantages: (1) the slope can settle without rupturing the lining; (2) ground water can filtrate through the lining; (3) wave energy will dissipate on the rough surface; and (4) repairs can be made easily. A sand-gravel blanket can be placed under the rockfill to protect the slope from the stripping action of waves. Large and small cast-in-place concrete slabs are discussed. Slope subsidence and resultant deformation may cause failures in slabs. Reinforced concrete slabs can be prefabricated into surface configurations that damp wave energy and reduce wave runup. Another type of lining consists of a 0.6-m-thick mattress ballasted with rock and covered with prefabricated concrete elements. Costs of the 6 types of linings are compared.

R203103 67A

Urbanowski, Jan

LINING OF SLOPES OF NAVIGABLE CANALS AND BANKS OF WATER RESERVOIRS

Gospod Wodna, Vol 25, No 10, pp 375-378, 1965. Transl from Pol, Tech Transl 67-56074, 1967. 7 p, 6 fig, 1 tab

District Water Board, Warsaw, Poland

DESCRIPTORS--/ *canal linings/ *slope protection/ *riprap/ embankments/ reservoirs/ wave run-up/ prefabrication/ rock fills/ *wave action/ rock blankets/ reinforced concrete/ foreign design practices/ cast-in-place structures/ linings/ filtration/ cost comparisons/ slabs/ hydraulic structures/ concrete/ concrete structures/ gravel blankets/ canals
IDENTIFIERS--/ Poland

R203150 68A COMPUTATION OF PRESSURE TUNNEL LININGS
A method is proposed for computing reaction coefficient and radial deformation around the cross section of a tunnel lining subjected to internal pressure. Radial deformations are determined from the general solution of a differential equation for the deformation of circular elastic ring; the method does not use arbitrary analytical relationships which do not describe the real character of radial deformations in tunnel linings. Computations show more reliable results are obtained if the coordinate system axes are rotated to a position parallel and normal to rock stratification. If experimentally determined reaction coefficients for different directions are available, the proposed method can be applied not only to orthotropic rocks but also to more complicated cases of anisotropic and nonhomogeneous rocks. Examples of tunnel lining computations are given.

R203150 68A

Eristov, V S

COMPUTATION OF PRESSURE TUNNEL LININGS IN ANISOTROPIC ROCKS

Hydrotech Constr, No 5, pp 436-442, May 1968. 7 p, 7 fig, 4 ref

DESCRIPTORS--/ *pressure tunnels/ *tunnel design/ *tunnel linings/ rock mechanics/ elastic deformation/ stratification/ deformation/ internal forces/ mathematical analysis/ linings/ bending moments/ tensile stress/ foreign design practices

IDENTIFIERS--/ USSR/ *ring displacements

R203158 68A EVAPORATION FROM BRINES UNDER CONTROLLED CONDITIONS
Laboratory studies made under a variety of climatic conditions and with different salt concentrations reveal the complexities and instabilities of salt-fresh water evaporation relationships. The studies support Harbeck's 1955 recommendations for research to supplement his report on procedures for design of lined brine disposal ponds. Earlier studies establish the fact that salts in solution reduce evaporation. However, actual amounts of reduction not known before are determined for several climatic parameters and saline contents. Variables of wind speed, air and water temperatures, and relative humidity are studied in a controlled environmental chamber. It was found that (1) evaporation can be expressed with a physical and a statistical model, (2) under constant water temperature, the effects exhibited by each variable are related to vapor pressure, (3) evaporation ratios vary depending on conditions present, and (4) in the solution profiles, both salt concentration and solution temperature remained essentially constant at all depths for any set of conditions imposed. The variables--air temperature, relative humidity, and salt concentration--give an increase in evaporation when decreased or a decrease in evaporation when increased.

R203158 68A

Moore, Jaroy and Runkles, J R

EVAPORATION FROM BRINE SOLUTIONS UNDER CONTROLLED LABORATORY CONDITIONS

Texas Water Develop Board Rep 77, May 1968. 69 p, 24 fig, 6 tab, 18 ref

Texas Agricultural Experiment Station, College Station

DESCRIPTORS--/ *model studies/ temperature/ *evaporation/ winds/ vapor pressure/ *brine disposal/ humidity/ solutes/ *environmental effects/ variability/ oil fields/ pollutants/ sodium chloride/ fresh water/ salinity/ *brines

IDENTIFIERS--/ *evaporation reservoirs/ *climatic variables/ *salt water disposal/ sized

R203015X67A SOME EFFECTS OF CYCLIC FLOODING OF SOILS
The effects of cyclic flooding and organic matter amendment on water infiltration for ground-water recharge were studied in a soil contained in barrel-type lysimeters. The top 6 in. of soil was amended with cotton gin trash at a rate equivalent to 20 tons per acre. The total volume of water transmitted through the lysimeters was used as a measure of the effectiveness of the cycles investigated. Within 150 days a 7-day flood-7-day dry cycle appeared to be better than either a 10-day flood-4-day dry cycle or continuous flooding. Hydraulic conductivity was determined for the total length of the lysimeter, the 0- to 3-cm, and 3- to 10-cm surface increments. Results of these measurements indicated that a clogging occurred in the 0- to 3-cm increment. Hydraulic conductivity under cyclic flood-dry conditions increased to a maximum value of 75 days and then gradually declined during the remainder of the 150-day study. Under continuous flood conditions, conductivity decreased throughout the experiment. Aggregate stability, pore radii, and hot water-extractable carbohydrate measurements followed the same trends as did the hydraulic conductivity. These changes were associated with the growth and accumulation of microbial tissues. Has 54 references.

R203015X67A

Worcester, Bruce K

THE EFFECT OF CYCLIC FLOODING ON BIOLOGICAL ACTIVITY AND HYDRAULIC CONDUCTIVITY OF A SOIL SURFACE

Department Agr Chem Soils, Univ Ariz, 1967. 127 p, 30 fig, 8 tab, 54 ref, 4 append, disc

University of Arizona, Tucson

DESCRIPTORS--/ *hydraulic conductivity/ *infiltration/ organic compounds/ bibliographies/ *groundwater recharge/ lysimeters/ porosity/ *artificial recharge/ algae/ ground water/ permeability/ soils/ *flooding/ cycles/ conductivity/ water spreading/ pores

IDENTIFIERS--/ *clogging/ *cyclic flooding

R203023 67A STATISTICAL ANALYSIS OF GROUND WATER
A trend-surface analysis of hydrogeologic data was carried out to derive techniques to be used in the selection of areas suitable for the development of future ground-water resources. The investigation was performed in aquifers of glacial origin, one supporting relatively small-scale municipal and industrial ground-water demands, another of large-scale requirements. Trend-surface maps and maps of the residuals from the trend-surfaces were prepared from water level data and evaluated to establish their relationship with the hydrogeologic regimen. The maps were compared with conventional piezometric maps drawn from the same data, and with known subsurface conditions and aquifer parameters. The fluctuations of these maps were compared with variations in recharge and discharge characteristics of the ground-water reservoir. From the results of this study, it was concluded that given suitable water level data, a mathematically computed surface could be considered to approximate the piezometric surface, and that those surfaces would be sensitive to changes in the aquifer parameters. The anomalous areas of the trend-surface or residual maps represent local effects superimposed on the required base and could be explained by a particular set of hydrogeologic conditions.

R203023 67A

Rockaway, J D and Johnson, R B

STATISTICAL ANALYSIS OF GROUND WATER USE AND REPLENISHMENT

Water Resources Res Center Tech Rep 2, Purdue Univ, Lafayette, Ind, Sept 1967. 128 p, 53 fig, 28 ref, 4 append

DESCRIPTORS--/ statistical analysis/ *ground water/ *groundwater recharge/ groundwater geology/ forecasting/ aquifers/ computer programming/ maps/ piezometers/ underground water storage/ hydrogeology/ groundwater basins/ Indiana

IDENTIFIERS--

R203025 67A GROUND WATER BASIN MANAGEMENT
The purpose of this project was to investigate fundamental problems of ground water dynamics and concepts for managing ground water basins. The research was conducted as a series of subprojects, the responsibility for each being assigned to a graduate student. The results have, or soon will be, reported in the form of 15 publications, including 2 articles in the technical journals, 7 research reports and 6 PhD dissertations. Following is a list of the subprojects completed: (1) Mechanics of Turbulent Flow, (2) Lateral Flow in the Unsaturated Zone, (3) Optimization of a Ground Water Basin, (4) Theoretical Analysis of Ground Water Basin Operation Studies, (5) Scheduling of Water Resources Developments in Emerging Nations, and (6) Techniques for Determining Ground Water Flow Fields.

R203025 67A

Todd, David K

SYSTEMS ANALYSIS FOR GROUND WATER BASIN MANAGEMENT

Water Resour Center Tec Completion Rep W105-1A-67, Univ California, Sept 1967. 10 p, 10 ref

University of California, Berkeley

DESCRIPTORS--/ systems analysis/ *ground water/ *groundwater flow/ turbulent flow/ water development/ water resources/ porous media/ optimization/ mathematical models/ *groundwater movement/ *groundwater basins/ water management (applied)

IDENTIFIERS--/ *groundwater management/ developing countries/ groundwater quality/ Navier-Stokes equation

R203043 68A INTERFACE UPCONING IN COASTAL AQUIFERS
For exploitation of fresh ground water in the coastal aquifer of Israel, shallow collector wells are being drilled to intercept fresh ground water flowing toward the sea. Local rise or upconing of the fresh water-saline water interface occurs during pumping. The equations for determining the shape of the rising interface are developed. Because of the nonlinear nature of the boundary conditions, a linearized approximate solution based on the method of small perturbations is described as an analytic solution for cases involving small deviations of the interface. Two- and three-dimensional cases are considered, and the range of validity for the analytical results is verified by experiments in a sandbox model.

R203043 68A

Dagan G and Bear J

SOLVING THE PROBLEM OF LOCAL INTERFACE UPCONING IN A COASTAL AQUIFER BY THE METHOD OF SMALL PERTURBATIONS

J Hydraul Res, Vol 6, No 1, pp 15-44, 1968. 30 p, 11 fig, 11 ref

Israel Institute of Technology, Haifa

DESCRIPTORS--/ *ground water/ *groundwater flow/ *salinity intrusion/ *aquifers/ fresh water/ saline water/ wells/ mathematical analysis/ two-dimensional/ three-dimensional/ hydrology/ movements/ foreign projects

IDENTIFIERS--/ *saline-nonsaline interfaces/ water wells/ Israel/ perturbation

R203072X68A MONITORING GROUND WATER QUALITY CHANGES
Good quality ground water is commonly interspersed with water of inferior quality. Inferior quality water may be naturally occurring salty water commonly underlying fresh water, or it may consist of enclaves of contaminated water from wastes that lie in fresh water bodies. Disposal of wastes on and into the ground and water well pumping cause dispersion of contaminated water. Economic methods are not available for determining boundry zones between contaminated and uncontaminated water. Much reliance is placed on monitoring wells. A prerequisite to monitoring is a synthetic hydrogeologic framework or model showing the behavior of the contaminated water. Such a conceptual model, using pertinent available data, helps assess the need for monitoring and helps guide the monitoring program for optimum results. Unplanned, indiscriminate monitoring of water from wells is expensive, inefficient, and fallible. Monitoring needs will increase in the future, but the proper objective is to improve the technology of determining contaminated water distribution so that monitoring can be minimized and conducted with optimum results.

R203072X68A

LeGrand, Harry E

MONITORING OF CHANGES IN QUALITY OF GROUND WATER

Ground Water, Vol 6, No 3, pp 14-18, May-June 1968. 5 p, 2 fig, 6 ref

Geological Survey, Raleigh, N C

DESCRIPTORS--/ detection/ *ground water/ *water quality/ contamination/ fluctuation/ movements/ measurement/ groundwater flow/ tracers/ *fresh water/ boundaries/ water pollution/ *wells/ subsurface investigations/ waste disposal/ radioactive isotopes/ aquifers/ dispersion/ saline water

IDENTIFIERS--/ variability/ monitoring/ monitors/ cone of depression/ evaluation/ hydrologic models

R203113 67A PROPERTIES OF DEEP SUBSTRATA MATERIALS
The purpose of this investigation was to determine the amounts and kinds of salts and slightly soluble minerals present in the substrata of the west side of the San Joaquin Valley, California. The study was initiated because artificial recharge of excessive surface water is planned in the future and the quality of the percolating water will be influenced by salts present in the substrata. Core samples taken from 19 drilling sites at depths ranging from 50 to 500 ft below ground surface were obtained with a rotary type drill rig. Soluble-salt content, 1:1 extract basis, varied from 0.2 to 10.4 me per 100 gm, between locations and with depth. Salt content was higher in alluvial fans than in the axial trough and virgin or nonirrigated lands also had higher salt contents than irrigated lands. The upper fans contained less soluble sodium percentages than the lower fans and the axial trough. Many sites contained heavy deposits of 20 to 50 me per 100 gm of gypsum. Lime was found in all profiles either in trace amounts or in large accumulations. The substrata material had cation-exchange capacities of plus or minus 25 me/100 gm. Sodium saturation was 4 to 15% of the exchange capacity. High boron concentrations, 5 to 11 ppm in 1:1 extract, were found in certain locations.

R203113 67A

Doneen, L D

I. PROPERTIES OF DEEP SUBSTRATA MATERIALS IN THE WEST SIDE OF THE SAN JOAQUIN VALLEY, CALIFORNIA

Hilgardia, Vol 38, No 9, pp 285-300, June 1967. 22 p, 9 fig, 12 tab, 10 ref, append

University of California, Davis

DESCRIPTORS--/ *salts/ artificial recharge/ percolating water/ lime/ profiles/ boron/ sodium/ gypsum/ alluvium/ physicochemical properties/ solubility/ cation exchange/ *subsoil/ specific retention/ soluble salts/ soil profiles

IDENTIFIERS--/ *San Joaquin Valley, Calif/ axial trough

R203116X67A DRAINAGE BY PUMPED WELLS
Drainage facilities were constructed in the Wellton-Mohawk District in southwestern Arizona to lower ground-water levels and prevent large area areas from going out of production. Drainage was achieved by pumping ground water from 100 wells and moving it out of the area by way of a 73-mi-long concrete lined conveyance channel. In March 1962, when the first Depth to Ground-water map was prepared, almost 26,000 acres of the 60,000 acres of land in the valley had a depth to ground water of 8 ft or less. By March 1964, the area with a 8 ft or less water table had been reduced to 7250 acres. The discharge from drainage wells was salty and caused a salinity problem with Mexico. This was solved when a bypass channel around Morelos Dam, Mexico's principal point of diversion on the Colorado River was placed in operation. Other factors, such as floodflows in the Gila River, have complicated the ground water and salinity control measures. The presence of bacteria in the wells has led to the use of corrosion-resistant materials for construction.

R203116X67A

Moser, Theodore H

DRAINAGE BY PUMPED WELLS IN WELLTON-MOHAWK DISTRICT

Amer Soc Civil Eng, J Irrig Drainage Div, Vol 93, No IR3, pp 199-208, Sept 1967. 10 p, 2 fig, 1 ref

Bureau of Reclamation, Yuma, Ariz

DESCRIPTORS--/ bypass channels/ salinity intrusion/ *drainage wells/ *bypasses/ conveyance structures/ groundwater/ irrigation/ salinity/ *saline water intrusion/ floodwater/ *concrete-lined canals/ pumping/ subsurface mapping

IDENTIFIERS--/ Wellton-Mohawk District/ Mexican Water Treaty 1944/ concrete linings/ Morelos Dam, Mex/ Gila Project, Ariz

R203122X68A PLAYA LAKE WATER TREATMENT FOR RECHARGE
Research was conducted in Bushland, Texas, to evaluate the usefulness of polyelectrolytes as flocculants on typical playa lake water and to design, construct, and test a simple field system using polyelectrolytes to clarify turbid playa lake water. Polyelectrolyte polymers are compounds of high molecular weight which have an electric charge which ionizes in solution. In laboratory tests cationic polyelectrolytes achieved better clarification at lower doses than either anionic or nonionic polymers. Treatment with 0.5 mg per l of cationic polyelectrolyte followed by 5 mg per l of alum reduced suspended solids from 210 mg per l to less than 20 mg per l. The field system removed 90% of the suspended solids from water containg over 200 mg per l of suspended solids at flow rates varying between 500 and 1000 gal per min. Cost for flocculant varied between $6.30 and $9.50 per acre ft. Ninety-four acre ft of muddy playa water was clarified and successfully recharged through wells. Has 15 references.

R203122X68A

Hauser, V L and Lotspeich, F B

TREATMENT OF PLAYA LAKE WATER FOR RECHARGE THROUGH WELLS

Trans Amer Soc Agr Eng, Vol 11, No 1, pp 108-111, 1968. 4 p, 9 fig, 3 tab, 15 ref

U S Department of Agriculture, Bushland, Tex

DESCRIPTORS--/ surface runoff/ floodwater/ aquifers/ *groundwater recharge/ *playas/ colloids/ permeability/ underground storage/ water treatment/ flocculation/ water quality control/ *recharge wells/ sediment control/ turbidity/ bibliographies

IDENTIFIERS--/ polyelectrolytes

R203125 67A DEPLETION OF STREAM FLOW BY STEADY WELLS
The flow of a stream that is hydraulically connected to an aquifer can be reduced considerably by nearby pumping wells. Pumping such wells will either increase the infiltration from nearby streams or decrease the natural groundwater flow that would have discharged into the streams if the wells had not been pumped, or effect both processes at the same time. The depletion of the stream flow is an increase to the perennial yield of the sand. Formulas are available for estimating the amount of induced infiltration from surface-water bodies which have fairly straight channels. Means for such estimates are not available when the wells are located near water bodies that border a quadrant aquifer. Formulas for estimating the rate and volume of stream depletion in right angle stream bends are developed in terms of extensively tabulated functions.

R203125 67A

Hantush, Mahdi S

DEPLETION OF FLOW IN RIGHT ANGLE STREAM BENDS BY STEADY WELLS

Water Resour Res, Vol 3, No 1, pp 227-240, 1967. 6 p, 1 fig, 1 tab, 15 ref

New Mexico Institute of Mining Technology, Socorro

DESCRIPTORS--/ *streamflow/ *wells/ infiltration/ aquifers/ *groundwater/ surface-groundwater relationships/ *withdrawal/ pumping

IDENTIFIERS--/ *streamflow depletion

R203126X67A LEGAL PROBLEMS IN MANAGING GROUND WATER
There are 4 legal categories interrelated hydrologically: watercourses, diffuse surface water, underground streams and percolating ground water. Ground water is contained in permeable limestone beds (aquifers). Two main Florida Aquifers are Floridan and Biscayne. Water table and artesian conditions exist. Ground-water problems are interference, overdraft, and contamination. Interference occurs between wells when cones of depression overlap. Overdraft results from pumping at a greater rate than intake from recharge area. Contamination includes pollution of ground water by industrial, municipal or private wastes, and salt water encroachment. These are met by well-cupping stature, multipurpose water management districts, establishment of salt water barrier lines, and pollution control. Ground water is underground streams or percolating and is presumed to be percolating unless shown otherwise. Surface water law covers underground streams. Percolating ground water is governed by 2 rules; under common law, landowner, without malice or waste, may extract unlimited amounts for use on overlying land despite harmful effects to neighbor; and under reasonable use, water may be used for beneficial purposes having reasonable relationship to land. Has 129 references.

R203126X67A

Maloney, Frank E and Plager, Sheldon J

FLORIDA'S GROUND WATER: LEGAL PROBLEMS IN MANAGING A PRECIOUS RESOURCE

Univ Miami Law Rev, Vol 21, No 4, pp 751-776, 1967. 25 p, 6 fig, 129 ref

University of Miami, Miami, Fla

DESCRIPTORS--/ *aquifers/ artesian wells/ *ground water/ *water laws/ water resources/ percolating water/ overdraft/ reasonable use/ legal aspects/ legislation/ Florida/ hydrologic cycle/ underground streams/ surface-groundwater relationships/ saline water intrusion

IDENTIFIERS--/ Floridan aquifer/ Biscayne aquifer/ cone of depression

R203127 68A TRANSIENT FLUID FLOW IN MULTILAYERED SYSTEMS
An analytical solution has been derived which gives the potential distribution in an infinite, 2-layer aquifer with crossflow that is pumped by a partially penetrating well at a constant rate of discharge. Using the finite element method, a new technique based on the minimization of an appropriate variational principle, numerical solutions have been obtained for several complex problems of transient fluid flow in layered systems. Because of the generality of this new approach with respect to arbitrary boundary conditions, a powerful new method of handling problems of fluid flow in complex systems is now available. Cases with both complete and partial penetration in the pumping well have been successfully analyzed. At distances that are less than 2 times the total thickness of a 2-layer system, both the effects of partial penetration and heterogeneity can be significant at early values of time. As time increases, the effects of heterogeneity slowly diminish and the effects of partial penetration dominate. At distances that are greater than 2 times the total thickness of a 2-layer system, the effects of partial penetration are negligible for all values of time and one must consider only the effects of heterogeneity, which slowly diminish with time. Has 74 references.

R203127 68A

Javandel, I and Witherspoon, Paul A

ANALYSIS OF TRANSIENT FLUID FLOW IN MULTI-LAYERED SYSTEMS

Water Resour Center, Univ California Rep 124, Mar 1968. 119 p, 34 fig, 2 tab, 74 ref, disc

University of California, Berkeley

DESCRIPTORS--/ wells/ contours/ unsteady flow/ bibliographies/ fluid flow/ *transients/ *groundwater flow/ *aquifers/ ground water/ porous media/ *stratification/ *groundwater movement/ pump testing/ saturated flow/ aquifer characteristics/ confined water/ analytical techniques/ approximation method/ mathematical models
IDENTIFIERS-- / *transient flow/ *finite element method

R203129 67A COMPUTER PREDICTION OF SALT IN SOIL
A computer method is presented for predicting the equilibrium salt concentration in a soil-soil solution-gypsum system and exchangeable cations at any given soil-moisture content from extract data obtained initially at a different moisture content. The calculations were based on ionic activities, solubility product constant of CaSO sub 4. 2H sub 2 O, dissociation constant of gypsum, and cation exchange equations. The computer program was developed for the IBM 7040 and a source statement along with a diagram to illustrate the flow of computation is included. Tests on five agricultural soils showed good agreement between computed and observed values.

R203129 67A

Tanji, K K; Dutt, G R; Paul, J L; et al

II. A COMPUTER METHOD FOR PREDICTING SALT CONCENTRATIONS IN SOILS AT VARIABLE MOISTURE CONTENTS

Hilgardia, Vol 38, No 9, pp 307-318, June 1967. 12 p, 1 fig, 1 tab, 14 ref

University of California and California State Department Water Resources, Davis

DESCRIPTORS--/ moisture content/ *soil chemical properties/ solubility/ equilibrium/ *salts/ agriculture/ *soils/ computer programs/ cation exchange/ solutes/ gypsum/ *saline soils

IDENTIFIERS--

R203132 67A GROUND-WATER RECHARGE IN ISRAEL
The hydrological aspects of recharge operations on the Coastal Plain Aquifer of Israel from 1959 to the present are reported and the methods, problems, and solutions involved in such an operation are discussed. The allowed withdrawal from the Coastal Plain Aquifer is estimated at about 200 million cubic meters per year. During the last 10 yr 426 million cubic meters per year have been withdrawn causing sea water intrusion to endanger water supply wells in Tel Aviv and Emek Hefer. As a counter measure recharge was practiced in 7 wells at a rate of 6 million cubic meters per year in Emek Hefer, the water coming from adjacent Cretaceous limestone aquifers. In Tel Aviv a fresh water barrier was established in 1964 by injecting lake water into 17 wells during winter at a rate of 6 million cubic meters per winter. Existing pumping wells were used for the recharge operations during the winter. Specific rate of recharge was about 2/3 of the specific capacity during pumping. Recharge by spreading was practiced in Yavneh and Nahan Shikma at rates of 10-13 and 8 million cubic meters per winter, respectively.

R203132 67A

Aberbach, S H and Sellinger, A

REVIEW OF ARTIFICIAL GROUNDWATER RECHARGE IN THE COASTAL PLAIN OF ISRAEL

Bull Int Ass Sci Hydrol, Vol 12, No 1, pp 65-77, Mar 1967. 14 p, 8 fig, 1 tab, 5 ref

TAHAL, Water Planning for Israel, Tel-Aviv

DESCRIPTORS--/ salinity intrusion/ salt water barriers/ *groundwater recharge/ aquifers/ *recharge wells/ drawdown/ water yield/ *saline water intrusion/ hydrology/ groundwater barriers/ saline-nonsaline interfaces/ water spreading/ *artificial recharge/ water levels/ safe yield/ groundwater mining/ pumping
IDENTIFIERS--/ Israel/ fresh water barriers

R203136X67A TRANSMISSION LOSS OF EPHEMERAL STREAMBEDS

A study on streamflow losses and their relation to ground-water conditions on the Walnut Gulch experimental watershed in southern Arizona is presented. Terrace deposits of alluvium from 1200-1600 ft in depth form the major portion of the watershed. About 70% of the total annual precipitation occurs as intense summer convective thunderstorms. Transmission losses are measured as the difference in runoff volume between flumes placed along Walnut Gulch. An example is given of a 1.58 in. rainfall in which there was a 16.5-acre-ft-per-mile loss rate representing an average infiltration rate of 3.5 in. per hr. Ground-water levels rose 18 ft in 1963 with 80 in. of surface infiltration, 60 ft in 1964 with 83 in., and no rise in 1965 with 20 in. of infiltration. A cutoff wall (20 ft in depth) of the flume may have ponded the transmission loss water and created a type of artificial recharge mechanism. It was found by well pump tests that the aquifer transmissibility was 60 gallons per day per foot of aquifer width. Well records for 1963-65 indicate an annual increase of subsurface water beneath the stream bed of Walnut Gulch if sufficient flow events are produced by summer precipitation.

R203136X67A

Wallace, D E and Renard, K G

CONTRIBUTION TO REGIONAL WATER TABLE FROM TRANSMISSION LOSSES OF EPHEMERAL STREAMBEDS

Trans Amer Soc Agr Eng, Vol 10, No 6, pp 786-789, 792, 1967. 5 p, 9 fig

U S Department of Agriculture, Tucson, Ariz

DESCRIPTORS--/ ***surface-groundwater relationships/ *subsurface waters/ thunderstorms/ *storm runoff/ hydraulic conductivity/ alluvium/ water loss/ semiarid climates/ aquifers/ Arizona/ *groundwater recharge/ *streamflow/ *water yield/ *flash floods/ land use/ gravels/ flumes/ rain gages/ hydrographs/ caliche/ sedimentation/ terraces (geological)**
IDENTIFIERS--/ **Walnut Gulch Watershed Ariz/ *transmission losses**

R203137 67A FACTOR ANALYSIS & GROUND-WATER CHEMISTRY

Factor analysis, a method of treatment which takes and rearranges data to present it in a manner that better explains the structure of the underlying system that produced the data, was applied to results of 103 chemical analyses of water samples. These were obtained from wells in the Upper and Middle Mojave River Valley, San Bernadino County, California. Results showed three principal types of water: calcium bicarbonate, sodium sulfate, and sodium chloride and many mixtures of these three. Data were studied to learn the relative importance of each ion in variations of the samples and to examine the possibility of chemical equilibrium between solid and aqueous phases in the aquifers. Critical information on chemical relationships basic to discovery of sources of constituents was furnished by factor analysis.

R203137 67A

Dawdy, D R and Feth, J H

APPLICATIONS OF FACTOR ANALYSIS IN STUDY OF CHEMISTRY OF GROUNDWATER QUALITY, MOJAVE RIVER VALLEY, CALIFORNIA

Water Resour Res, Vol 3, No 2, pp 505-510, 1967. 6 p, 1 fig, 3 tab, 9 ref

Geological Survey, Menlo Park, Calif

DESCRIPTORS--/ ***groundwater/ *statistical methods/ California/ *water quality/ sodium sulfate/ sodium chloride/ correlation analysis/ water chemistry/ regression analysis/ variability/ calcium carbonate/ water analysis/ correlation techniques/ chemical analysis**

IDENTIFIERS--/ **Mojave River, Calif**

R203138X67A ARTESIAN WATER IN NIGERIA'S SOKOTA BASIN

Borehole exploration sponsored by US AID and the Geol Surv of Nigeria, with technical guidance from the USGS, was conducted in the Sokota basin in semi-arid northwestern Nigeria where 2 million people use less than 5 mgd from dug wells and 1 mgd from boreholes. The basin consists of semiconsolidated Cretaceous and Tertiary deposits. This study revealed that the Gwandu Formation contained a productive artesian sand aquifer throughout a 5,700 square mile area with transmissibilities as high as 180,000 imperial gallons a day per foot, decreasing toward the west. The free flow areas totaled about 1000 square miles with pressure heads in boreholes up to plus 83 ft above land surface and individual flows were as great as 12,000 imperial gallons per hour. The quality of water from all pressure aquifers was good, although iron content was high in places and salinity increased in the very deep aquifers. This newly discovered artesian flow will help provide water to remote villages and even supplement irrigation.

R203138X67A

Anderson, H R and Ogilbee, W

EXPLORATION FOR ARTESIAN WATER IN THE SOKOTO BASIN, NIGERIA

Groundwater, Vol 5, No 3, pp 42-46, July 1967. 5 p, 3 fig

Geological Survey, Washington, D C

DESCRIPTORS--/ *artesian wells/ *boreholes/ subsurface investigations/ ground water/ aquifers/ water quality/ drilling/ wells/ *water supplies/ semiarid climates/ confined water/ pressure/ underground storage/ water pressure/ transmissivity

IDENTIFIERS--/ Sokota Basin, Nigeria

R203146X68A DIGITIZING OBSERVATION-WELL HYDROGRAPHS

This article treats not only the digitizing but also the storing and recovery of hydrographs as well as the efficiency of recording, record losses and accuracy. Apparently accuracy increases with an increasing number of records--water level vs time--but efficiency deteriorates while the probability of losing records increases. The hydrologic data considered was from the interior Plains of Canada. Digital recording is advantageous because of the relatively small amount of recording media used for a hydrograph and economy of processing costs. Basic methods of recording are compared, namely fixed time interval vs fixed water level types. The complete set of equations and example data developed would permit the best method of recording and storing digital hydrographs to be established in an area with accuracy being the prime concern in the overall character of a system.

R203146X68A

Gilliland, J A

DIGITIZING, STORING AND RECOVERING OBSERVATION-WELL HYDROGRAPHS

J Hydrol, Vol VI, No 2, pp 142-167, Apr 1968. 25 p, 6 fig, 5 tab, 3 ref

Department of Energy, Mines and Resources, Ontario, Canada

DESCRIPTORS--/ *hydrographs/ *digital recording systems/ ground water/ hydrologic data/ *wells/ water table/ *observation wells/ *recording systems/ time/ records

IDENTIFIERS--/ accuracy/ water level

R203152 68A GROUNDWATER LEVELS IN NORTH DAKOTA, 1966
Measurements of 1966 water levels in 152 observation wells in North Dakota are tabulated. For some wells, water levels for 1963-65 also are reported. Some of the objectives of the water-level program are to provide: (1) long-term records of water-level fluctuations in aquifers, (2) information on changes in groundwater storage, (3) data for base-flow predictions, and (4) data for water-resources research. Water levels in water-table wells fluctuate in response to the effects of recharge (largely from snowmelt and spring rain) and discharge (by evapotranspiration, pumping, and seepage to streams). Artesian aquifers fluctuate primarily in response to pumping and various pressure changes. In addition to water-level records, the report contains county maps showing observation-well locations, hydrographs of representative wells, as well as a list of 24 county groundwater reports and 68 reports for local areas. Has 92 references.

R203152 68A

Randich, P G

GROUND-WATER LEVELS IN NORTH DAKOTA, 1966

N Dak State Water Comm Ground-Water Study 74, 1968. 117 p, 33 fig, 92 ref

Geological Survey, Bismarck, N Dak

DESCRIPTORS--/ *observation wells/ North Dakota/ *groundwater/ *water levels/ hydrologic data/ *water level fluctuations/ subsurface waters/ aquifers/ hydrogeology/ water table/ confined water/ water wells/ data collections/ underground storage/ seepage/ geohydrologic units

IDENTIFIERS--/ *well data/ *data networks/ groundwater sources

R203217 68A GROUND-WATER DATA, POLK COUNTY, NEBRASKA
Ground-water basic data is presented for Polk County, in the Big Blue River basin of east-central Nebraska. The data include a descriptive sample log of an observation well drilled in 1959, descriptive data for 782 irrigation and 24 municipal wells, periodic water-level measurements in 53 wells, and chemical analyses of water from 9 wells. Logs of 29 test holes drilled in 1942-49 were given in an earlier report; an interpretive report of the ground-water resources is being prepared. About 71,000 acres were being irrigated with ground-water in 1965.

R203217 68A

Smith, F A and Weakly, E C

GROUND-WATER DATA, POLK COUNTY, NEBRASKA

Nebr Water Surv Pap 22, Univ Nebr, May 1968. 40 p, 4 fig, 4 tab, 4 ref

University of Nebraska, Lincoln

DESCRIPTORS--/ *hydrologic data/ *water quality/ water sources/ water table/ aquifers/ observation wells/ chemical analysis/ water analysis/ *water wells/ *groundwater/ Nebraska/ data collections/ water level fluctuations/ water levels/ *irrigation wells

IDENTIFIERS--/ *municipal wells/ well data

R203218 68A WATER LEVELS IN FLORIDA AQUIFERS, 1963-64

Trends and water-level fluctuations are summarized for the principal water-table and confined aquifers in Florida. The principal aquifers in the state are the Biscayne aquifer in the southeastern part, the Floridan aquifer in the central and northern part, and the sand and gravel aquifer in the extreme northwestern part. Graphs of pumpage for each of the major cities for periods of 20 to 40 yr show a substantial increase in pumping in all areas since 1940. Water-level hydrographs of wells in all parts of the state illustrate water-level changes and trends. In several heavily pumped areas, water levels have declined several ft since 1947. Small maps show the piezometric surface of the Floridan aquifer and area of artesian flow, locations of observation wells, and changes in water levels in heavily pumped areas. Water-level data are obtained from a network of about 1,000 observation wells in all parts of the state. Well and water-level data for 329 of these wells are tabulated. The table includes the highest and lowest water levels measured prior to 1963, highest May or June water levels in 1963 and 1964, and the annual range of fluctuation for 1963 and 1964.

R203218 68A

Healy, Henry G

WATER LEVELS IN ARTESIAN AND NONARTESIAN AQUIFERS OF FLORIDA, 1963-64

Florida Div Geol Inform Circ 52, 1968. 68 p, 46 fig, 1 tab

Geological Survey and Florida Division of Geology, Tallahassee

DESCRIPTORS--/ water table/ aquifers/ *hydrographs/ artesian wells/ *observation wells/ water utilization/ saline water/ fluctuation/ water wells/ *water levels/ *water level fluctuations/ *groundwater/ Florida/ confined water/ pumping/ withdrawal/ piezometry/ potentiometric level/ *hydrogeology/ subsurface waters
IDENTIFIERS--/ artesian aquifers/ groundwater hydrology/ *groundwater hydrographs

R203228 68A GROUNDWATER, PARADISE VALLEY, MARICOPA COUNTY, ARIZ

A description and an analysis of groundwater conditions in Paradise Valley, Arizona, are presented. The area is underlain by more than 1,500 ft of water-yielding alluvial deposits--divided into lower, middle, and upper units--which in places overlie the red unit of conglomerate and siltstone. Although the alluvial deposits and red unit combine hydrologically to form an aquifer system, each unit differs in water-yielding capacity. Yield-drawdown data for wells in southern Paradise Valley indicate that the upper and lower alluvium and red unit are more permeable and yield more water to wells than the middle alluvium. In central and northern parts of the valley, wells are less productive, the upper alluvium being dry in much of the area. Although hard, the groundwater is suitable for municipal, irrigation, and farm uses. In the southern part of the valley, however, water from some wells contains more than recommended amounts of dissolved solids for domestic use. Annual withdrawal increased from 44,000 acre-ft in 1946 to 80,000 acre-ft in 1964. Public supply usage in 1965 was 4 times that of 1945: this reflects conversion of agricultural land to an expanding metropolitan area. Has 16 references.

R203228 68A

Arteaga, F E; White, Natalie D; Cooley, M E; et al

GROUND WATER IN PARADISE VALLEY, MARICOPA COUNTY, ARIZONA

Arizona State Land Dep Water Resour Rep 35, May 1968. 76 p, 15 fig, 5 tab, 16 ref, append

Geological Survey, Phoenix, Ariz

DESCRIPTORS--/ canal seepage/ water table/ artesian wells/ *chemical properties/ water utilization/ *permeability/ *aquifer characteristics/ geologic control/ alluvium/ Arizona/ conglomerate rocks/ recharge/ specific capacity/ hardness (water)/ groundwater movement/ groundwater basins/ water management (applied)/ *groundwater/ bibliographies
IDENTIFIERS--/ yield-drawdown relationships/ Paradise Valley, Ariz/ drawdown curves/ *groundwater system

R203234X68A SIMPLIFIED SOLUTION FOR VARIABLE RATE PUMPING TEST
A simplified graphical solution is developed for determining coefficients of transmissivity and storage from a variable discharge pumping test. The method is based on Jacob's formula and a graphical plot that gives transmissivity equals 1/4 (pi)(m), where (m) is the slope of the plotted line. The solution is valid for values of u less than 0.01.

R203234X68A

Sternberg, Yaron M

SIMPLIFIED SOLUTION FOR VARIABLE RATE PUMPING TEST

Proc Amer Soc Civ Eng, J Hydraul Div, Vol 94, No HY1, pp 177-180, Jan 1968. 4 p, 1 fig, 1 tab, 4 ref, append

Indiana University, Bloomington

DESCRIPTORS--/ hydraulics/ *ground water/ permeability/ aquifers/ *wells/ graphical analysis/ *transmissivity/ aquifer characteristics/ *analytical techniques/ *storage coefficient/ hydrologic properties/ subsurface waters/ *pumping

IDENTIFIERS--/ *aquifer tests

R203236 68A GROUNDWATER, GREEN RIVER FORMATION, UINTA BASIN, UTAH
Relatively fresh groundwater occurs in moderately large quantities in parts of the outcrop of the Eocene Green River Formation, Uinta Basin, Utah, which also contains large reserves of bituminous sand and oil shale. Whether the hydrocarbons can be developed economically depends in large measure on available process water of suitable chemical quality. Sufficient water may be locally at hand in aquifers that now furnish many wells and springs. Analyses of water from 51 wells and a spring indicate that 4 sources were fresh (less than 1,000 ppm dissolved solids), 18 were slightly saline (1,000 to 3,000 ppm), and the remainder were moderately saline to briny. Average annual precipitation in most of the basin is less than 12 in., but 20 to 30 in. falls on the high areas of the basin's south and west sides. Because development of the large hydrocarbon reserves can be economically more feasible if sources of suitable water are available, detailed hydrologic appraisals of occurrence, distribution, quantity, and quality of the groundwater are needed.

R203236 68A

Feltis, R D

PRELIMINARY ASSESSMENT OF GROUND WATER IN THE GREEN RIVER FORMATION, UINTA BASIN, UTAH

Geol Surv Prof Pap 600-B, pp B200-B204, 1968. 5 p, 1 fig, 1 tab, 2 ref

Geological Survey, Billings, Mont

DESCRIPTORS--/ *chemical analysis/ wells/ hydrologic data/ fresh water/ water analysis/ mining/ saline water/ *ground water/ *aquifers/ Utah/ *water supply/ mineral industry/ *oil shale/ aquifer characteristics/ springs/ precipitation (atmospheric)

IDENTIFIERS--/ Green River Formation/ Uinta Basin, Utah/ *aquifer potential

R203243X68A INFILTRATION INTO SOILS WITH HYSTERESIS

Drainage and inflitration in partially saturated soils exhibit hysteresis because of the negative water pressure which results from previous wetting and drying. Numerical methods are used to solve the differential equation describing vertical flow in such soils. By using a digital computer, solutions are obtained for different initial and boundary conditions. These solutions representing alternating infiltration and drainage cycles in the absence of evaporation in a uniform soil of infinite depth with a uniform moisture content. The hysteresis in the moisture-suction relationship was taken into account by means of the concept of independent domain and the use of limiting assumptions. Graphs of moisture-distribution profiles and effective saturation against time show that the main force acting during infiltration is capillarity rather than gravity. Has 17 references.

R203243X68A

Ibrahim, Hassen Ali and Brutsaert, Wilfried

INTERMITTENT INFILTRATION INTO SOILS WITH HYSTERESIS

Proc Amer Soc Civ Eng, J Hydraul Div, Vol 94, No HY1, pp 113-137, Jan 1968. 25 p, 19 fig, 2 tab, 17 ref

Cornell University, Ithaca, N Y

DESCRIPTORS--/ hydraulics/ *drainage/ *infiltration/ *hysteresis/ soil water/ moisture content/ bibliographies/ *soil water movement/ drainage effects/ mathematical models/ capillary action/ capillary conductivity/ negative pore pressure

IDENTIFIERS--/ infiltration rate/ infiltration cycles/ infiltration capacity

R203244 68A NEUTRON MOISTURE MEASUREMENTS PROCEDURES

A recently developed neutron meter records moisture measurements by continuous and point-logging procedures. An important application is the measurement, in drill holes, of moisture changes with time in the unsaturated zone. Field calibration of the meter shows a linear relationship between instrument reading and moisture content over a range of 5 to 40% moisture by volume. Comparison of neutron mositure logs obtained by different logging procedures illustrates that a compromise must be made between logging time, bed definition, and curve reproducibility. Tests indicate that point-logging, using close logging intervals, provides the more accurate results. Continuous-logging, which requires much less time and manual operation, can provide acceptable logs for many moisture studies. Good zone definition and moisture-change accuracy are obtainable in continuous logging at a speed of 0.8 ft per min and time constant of 20 sec. Graphs showing results of both logging procedures are given.

R203244 68A

Prill, Robert C and Meyer, Walter R

NEUTRON MOSITURE MEASUREMENTS BY CONTINUOUS- AND POINT-LOGGING PROCEDURES

Geol Surv Prof Pap 600-B, pp B226-B230, 1968. 5 p, 4 fig, 3 ref

Geological Survey, Garden City, Kans

DESCRIPTORS--/ instrumentation/ calibrations/ sediments/ drill holes/ moisture content/ stratification/ drainage/ ground water/ gravitational water/ *nuclear moisture meters/ *borehole geophysics/ hydrologic properties

IDENTIFIERS--/ *neutron moisture probes

R203246 68A EFFECTS OF SEWERING ON WATER LEVELS, LONG ISLAND, N.Y.
Double-mass-curve analysis of groundwater levels in Nassau County, Long Island, shows that water levels in a 50-sq mi area sewered in the early 1950's have declined an average of 10 ft relative to an unsewered area nearby. Analysis of factors causing this relative decline indicates that about 7 ft was caused by sewering and the remainder, by pumping in Queens County, urbanization, and the 1961-66 drought. At specific locations, water-level decline from sewering ranged from 1 to 15 ft. Assuming a specific yield of 20% for the shallow aquifer, the estimated average loss of groundwater from storage as a result of sewering is about 3 mgd since 1953. The decline in groundwater levels has been accompanied by pronounced reductions in streamflow, corresponding to an average of about 3.3 cfs (2 mgd) since 1953. Streamflow losses averaged about 5.7 cfs for the period 1958-66 in the 2 gaged streams within the sewered area.

R203246 68A

Franke, O L

DOUBLE-MASS-CURVE ANALYSIS OF THE EFFECTS OF SEWERING ON GROUND-WATER LEVELS ON LONG ISLAND, NEW YORK

Geol Surv Prof Pap 600-B, pp B205-B209, 1968. 5 p, 2 fig, 2 tab, 2 ref

Geological Survey, Mineola, N Y

DESCRIPTORS--/ *sewers/ aquifers/ streamflow/ groundwater recharge/ runoff/ droughts/ drainage/ waste disposal/ sewage effluents/ *ground water/ *surface-groundwater relationships/ *water level fluctuation/ New York/ urbanization/ mass curves/ groundwater movement/ pumping/ drainage water/ gaging stations/ *subsurface drainage
IDENTIFIERS--/ Long Island, N Y

R203251X68A WATER-TABLE STUDY VERIFIES SOIL INTERPRETATIONS
Soil-drainage characteristics, interpreted from published soils maps, were verified by water-table measurements made in observation wells at 35 sites in Montgomery County, Pennsylvania. Poorly drained soils generally are light gray in color and remain wet a large part of the time. The water table beneath such soils was less than 1.5 ft below the surface during 8 months of a 1 yr study. The well-drained soils are brownish, yellowish, or reddish, and drain rapidly enough to prevent soil saturation for a significant period of time. Most of the time the water table beneath these soils was at depths of 3 ft or more. The records of water levels in the observation wells substantiated the interpretations of drainage capabilities for the 4 soil classes. The moderately-drained to poorly-drained soils have severe limitations for on-site disposal of sewage through septic tanks. Wet basements and contamination of drinking water are other problems associated with the poor soil drainage.

R203251X68A

Latshaw, Gerald J and Thompson, Robert F

WATER TABLE STUDY VERIFIES SOIL INTERPRETATIONS

J Soil Water Conserv, Vol 23, No 2, pp 65-67, Mar-Apr 1968. 3 p, 1 fig, 2 tab, 2 ref

Soil Conservation Service, Harrisburg and Norristown, Pa

DESCRIPTORS--/ *soil classifications/ *water table/ *drainage/ drainage effects/ observation wells/ septic tanks/ soil engineering/ soil types/ *soil water/ *water level fluctuations/ *subsurface drainage/ drainage engineering/ subsurface waters/ Pennsylvania/ *groundwater

IDENTIFIERS--/ soil characteristics

R203253X68A MATHEMATICAL SOLUTION FOR FLOW INTO A FINITE WELL
The problem of determining the drawdown in response to flow from a finite radius well fully penetrating an infinite confined aquifer, where the rate of flow from the well is an arbitrary function of time, is solved exactly. Fourier transforms are used for a solution involving a minimum of boundary conditions. The boundary conditions chosen enable either the drawdown to be determined from the outflow, or the flow to be determined if the drawdown is known as a function of time at any distance from the well. For both cases, the aquifer characteristics must be known. In the limit where the well radius is small and the flow rate constant, the solution is shown to generate the Theis equation. The general solution presented is applicable to any problem where the discharge is a known function of time. The technique discussed should be readily applicable to more complex cases.

Wigley, T M L

R203253X68A

FLOW INTO A FINITE WELL WITH ARBITRARY DISCHARGE

J of Hydrol, Vol 6, No 2, pp 209-213, Apr 1968. 5 p, 5 ref

University of Adelaide, Australia

DESCRIPTORS--/ drawdown/ hydraulic conductivity/ hydrodynamics/ *aquifer characteristics/ *Theis equation/ *transmissivity/ *mathematical models/ mathematical studies/ *groundwater movement/ equations/ *groundwater/ flow rates/ *water wells

IDENTIFIERS--/ *finite-radius wells/ pumping tests

R203257 68A MAPPING VERTICAL VARIABILITY OF AQUIFERS
The distribution of fresh-water sands within the total fresh-water section can be considered as an irregular frequency distribution; then employing the method of moments a description of smooth distribution is obtained using the first 4 moments to calculate the following 4 statistical measures: center of gravity (weighted average), standard deviation, skewness, and kurtosis. Assuming statistical measures are continuous functions, each can be contoured to show areal distribution. Reliable data from 110 wells provided sufficient control to contour 4 areas with different geologic conditions in Mississippi. Center of gravity and standard deviation produced relatively simple contour maps to reflect simple contour patterns. Skewness and kurtosis did not produce maps with simple contour patterns, and in most of the areas mapped, values indicate that smoothed distribution is not a normal probability distribution. This implies that all 4 statistical measures must be used to make statistical inferences with confidence. Although statistical maps provide only part of a series required to evaluate fresh-water sections adequately, they may have practical application in planning ground-water developments, and estimating depth for test holes so a significant part of fresh-water section should reasonably be tested.

Keady, Donald M

R203257 68A

APPLICATION OF MOMENTS TO MAPPING THE VERTICAL VARIABILITY OF THE AQUIFER SYSTEMS IN MISSISSIPPI

Water Res Inst Rep, Mississippi State Univ, 1968. 31 p, 8 fig, 1 tab, 11 ref, 2 append

Mississippi State University, State College

DESCRIPTORS--/ *aquifers/ geomorphology/ distribution/ mapping/ wells/ *water sources/ *statistical analysis/ fresh water/ *ground water/ sands/ hydrogeology/ statistical methods/ Mississippi/ aquifer characteristics/ logging (recording)

IDENTIFIERS--/ standard deviation

R203261 68A STATISTICAL POROUS MEDIA HYDRODYNAMICS
An investigation was made of the stochastic aspects of single and multiple phase flow through porous media. The complete correspondence between transport theory and thermodynamics has been established, and the corollaries of the thermodynamic stability conditions in transport theory have been investigated. A further development of the usual correspondence between transported quantities and thermodynamics has been obtained by an attempt to extend the theory to nonpositive definite transported quantities. The theory has then been applied to flow through porous media, as exemplified by ground-water flow. A general investigation has been made of the possibility of the development of a steady state in frontal displacement processes in porous media with and without fingers, with the result that stabilization appears impossible. Finally, a new type of statistical model for flow through porous media was investigated, based on a random ensemble of topological graphs. Has 16 references.

R203261 68A

Scheidegger, A E

STATISTICAL POROUS MEDIA HYDRODYNAMICS

Res Rep 17, Univ Illinois, July 1968. 70 p, 5 fig, 1 tab, 16 ref

University of Illinois, Urbana

DESCRIPTORS--/ fluid flow/ *hydrodynamics/ *porous materials/ *ground water/ thermodynamics/ groundwater flow/ dispersion/ bibliographies/ statistical analysis/ *porous media/ stochastic processes/ statistical models

IDENTIFIERS--

R203263 67A MOVEMENT OF MICRON-SIZE PARTICLES THROUGH A SAND BED
Movement of certain radioactive ions and other impurities over considerable distances through underground aquifers is of great interest in areas where control of radioactive waste and other environmental pollutants is a concern. To study this phenomenon, scandium-46 was adsorbed to micron-size kaolin particles dispersed in water and the suspension was allowed to percolate slowly through a horizontal packed bed of sand 2 m long, 1 m wide, and 0.25 m thick which served as a model aquifer. Continuous analyses of the effluent for particulate load, dissolved ions, and radioactivity showed that a finite fraction of radioactively labeled particles, approximately 0.025%, was carried through the bed. Also, lateral scanning and vertical coring of the sand bed, after completion of the test, showed that the bulk of the radioactive particles had been removed by filter action within the first 10 cm of packed sand bed. Experiments established that it is possible for suspended micron-size particles in flowing water to compete with the ion exchange processes on sand particle surfaces for trivalent ions, such as scandium and ruthenium, and to transport them large distances through an aquifer. This mechanism helps to explain the apparently anomalous mobility of ruthenium from reactor fuel waste disposal areas. Has 48 references.

R203263 67A

Champlin, Jerry B G

THE MOVEMENT OF MICRON-SIZE PARTICLES THROUGH A SAND BED

Water Resour Center Rep WRC-0867, Georgia Inst Technol, Dec 1967. 106 p, 20 fig, 6 tab, 48 ref

Georgia Institute of Technology, Atlanta

DESCRIPTORS--/ *aquifers/ ions/ *radioactive contamination/ percolation/ bibliographies/ model tests/ filters (fluid)/ filtration/ tracers/ water pollution/ sands/ capillarity/ sensors/ *radioactive wastes/ groundwater movement/ ground water/ *groundwater flow/ *radioactive waste disposal

IDENTIFIERS--

R203267 67A CATIONS IN GROUND WATER
This is the first study of the trace-element content of subsurface water in a petrologically complex metamorphic terrain. A correlation exists between the enclosing rock type and the trace-element content of the ground water. The limited data presented indicate that ground water quickly changes character with a change in enclosing rock type. Twelve wells were analyzed for Ca, Mg, Zn, Cu, Fe, and Mn by atomic-absorption spectrophotometry. Analyses began in December 1965, and continued until July 1966. Well water temperature and regional rainfall were also measured and tabulated. Seasonal variations have a pronounced effect upon the trace-element content. These changes result from variations in temperature, rainfall amount, and, very likely, the rate of organic activity. Results of this investigation show the following: (1) the quantitative dependence of ground-water trace constituents to enclosing rock type; (2) the adjustment of migrating ground water to contrasting lithologies; (3) the quantitative variations in ground-water compositions with seasonal and rainfall variations; and (4) the possible relation between specific trace-element contents and organic activity.

R203267 67A

Salotti, Charles A and Fouts, James A

SPECIFIC CATIONS IN GROUND WATERS RELATED TO GEOLOGIC FORMATIONS IN THE BROAD QUADRANGLE, GEORGIA

Geol Surv Bull No 78, Ga State Div Conserv, 1967. 34 p, 6 fig, 5 tab, 10 ref, 4 append

Georgia State Division of Conservation and Georgia Institute of Technology, Atlanta

DESCRIPTORS--/ *groundwater flow/ subsurface investigations/ mineralogy/ geological surveys/ wells/ sampling/ petrology/ chemical analysis/ water analysis/ *ground water/ minerals/ geologic formations/ *trace elements/ *tracers/ geochemistry/ subsurface waters/ geologic mapping/ Georgia/ spectrometers
IDENTIFIERS--/ geologic maps

R203274 68A WATER-WELL DATA, TOWNSHIPS 11-25, ALBERTA
Data recorded through December 31, 1964, and some for 1966 are presented for about 3,000 wells in the southern part of Alberta (townships 11-25). Well information given includes location, physical description, year drilled, depth to water, aquifer, yield, water quality, a log if available, and other pertinent data.

R203274 68A

Geiger, K W; De Vries, P H; Withers, D W

WATER-WELL RECORDS, ALBERTA TOWNSHIPS 11-25

Res Counc Alberta Rep 66-4, Dec 1968, 136 p, 1 fig, 2 tab

Research Council of Alberta, Edmonton, Canada

DESCRIPTORS--/ *aquifers/ foreign countries/ water yield/ water quality/ water utilization/ water table/ *groundwater/ *water wells/ hydrologic properties/ water levels/ hydrogeology/ data collections/ subsurface waters/ Canada

IDENTIFIERS--/ *well data/ well yield

R203276 67A RADIOACTIVE ELEMENTS IN AN AQUIFER
Radioactive solutions were injected into a model aquifer containing 1600 pounds of sand with dimensions of 1 by 2 by 0.25 meters. Radioactive solutions were injected into a model aquifer containing 1600 pounds of sand with dimensions of 1 by 2 by 0.25 meters. Radioactive sodium-24 was dissolved in dilute sodium chloride solution and passed into the aquifer where it displaced fresh water which had saturated the sand. Analyses were made on the effluent for sodium, potassium, and calcium by flame analyses; for particulate size distribution and concentration with a Coulter counter; and for radioactivity with scintillation detectors. As the activity passed through the sand, its progress was followed by use of a collimated Geiger-Muller tube on the exterior of the bed. Arrival of the radioactivity and an increase in the particulate matter suspended in the effluent. Corresponded with relatively sharp conductivity, pH, pK, and pCa change which marked the arrival of the sodium front. The sodium and the ruthenium studies indicated that significant amounts of radioactive ions were transported through the test bed on particulate matter which is large enough to be trapped on 0.45 micron membrane filters. Has 20 references.

R203276 67A

Champlin, J B F and Eicholz, G G

THE MOVEMENT OF RADIOACTIVE SODIUM AND RUTHENIUM THROUGH A SIMULATED AQUIFER

Pap, Georgia Inst Technol, 1967. 23 p, 6 fig, 20 ref

Georgia Institute of Technology, Atlanta

DESCRIPTORS--/ *aquifers/ ions/ *radioactive contamination/ percolation/ bibliographies/ model tests/ filters (fluid)/ filtration/ tracers/ water pollution/ capillarity/ sensors/ *radioactive wastes/ ground water/ *groundwater flow/ *radioactive waste disposal/ groundwater movement/ sands/ sodium/ simulation
IDENTIFIERS--

R203279 68A EFFECTS OF IRRIGATION PUMPING, DIAMOND VALLEY, NEVADA
An appraisal of the effects of pumping during 1950-65 indicates that groundwater storage in the valley was depleted by about 60,000 acre-ft. This is roughly the net pumpage for the period but is only 3% of water in storage in the upper 100 ft of saturated valley-fill. Annual recharge is estimated at 30,000 acre-ft--21,000 from precipitation and 9,000 from inflow. Natural discharge is 30,000 acre-ft--5,000 by evaporation from a playa in the northern half of the basin and 25,000 by evapotranspiration. Pumpage, concentrated in the southern half of the valley, was 12,000 acre-ft in 1965, but permits have been granted for 150,000 acre-ft/yr. At 1965 rate, depletion would have to be 3 million acre-ft to establish a new groundwater equilibrium. Water quality is good now but may deteriorate from recycling of water or migration of poor quality water from the playa. The aquifer in the southern half of the valley has 20 to 80 ft of gravel in the upper 100 ft, a transmissibility coefficient of 50,000 to about 100,000 gpd/ft, and a natural depth to water of 20 to 120 ft. Maps show distribution of geologic units and phreatophytes, contours on the water table in 1950 and 1966, and decline of water levels in that interval. Tables give data on runoff, chemical analyses, wells, and drillers logs.

R203279 68A

Harrill, J R and Lamke, R D

HYDROLOGIC RESPONSE TO IRRIGATION PUMPING IN DIAMOND VALLEY, EUREKA AND ELKO COUNTIES, NEVADA, 1950-65, with a section on SURFACE WATER, by R D Lamke

Nev Dep Conserv Natur Resour Water Resour Bull 35, 1968. 108 p, 17 fig, 3 plate, 21 tab, 51 ref

State of Nevada Department of Conservation and Natural Resources

DESCRIPTORS--/ *groundwater recharge/ water quality/ evapotranspiration/ geologic formations/ water utilization/ phreatophytes/ *aquifers/ water sources/ *groundwater/ Nevada/ irrigation water/ *hydrogeology/ areal/ discharge (water)/ withdrawal/ *hydrologic budget/ water supply/ transmissivity/ pumping/ hydrologic properties
IDENTIFIERS--/ *depletion/ pumpage/ alluvial aquifers/ water level fluctuations/ storage depletion/ inflow

R203281 68A GROUND WATER RESOURCES IN CONNECTICUT

A hydrogeologic appraisal of the 127-sq-mi Hamden-Wallingford area, Connecticut, reveals that present withdrawals total 4 billion gal/yr from several aquifers. This is only 15% of the ground-water supply potentially available. Large recharge potential is offered by the Quinnipiac and Mill Rivers. Therefore, upper limits of ground-water development can be set by distribution of thick permeable glacial materials, particularly ice-contract deposits, Through these, wells can induce infiltrate from surface streams. Quality of all aquifer waters is good; dissolved solids content ranges from 40 to 250 ppm. Well yields range from a few gallons a minute for glacial till to as much as 1750 gpm for the coarse-grained, ice-contact deposits. Glacial lake deposits are fine grained and low in permeability. They yield small water supplies and at places form a leaky aquiclude over aquifers in ice-contact deposits. Large scale topographic base maps show geology, data wells, water table contours, saturated thickness of unconsolidated deposits, and areas favorable for artificial recharge. Has 21 references.

R203281 68A

LaSala, A M, Jr

GROUNDWATER RESOURCES, HAMDEN-WALLINGFORD AREA, CONNECTICUT

Conn Water Resour Bull 14, 1968. 20 p, 5 fig, 5 tab, 21 ref

Connecticut Water Resources Commission and Geological Survey

DESCRIPTORS--/ aquifers/ seepage/ chemical analysis/ hydrographs/ till/ permeability/ aquicludes/ water utilization/ bibliographies/ geologic mapping/ *geohydrologic units/ *aquifer characteristics/ groundwater movement/ *surface-groundwater relationships/ *glacial drift/ induced infiltration/ Connecticut/ natural recharge

IDENTIFIERS--/ *unconsolidated deposits/ *groundwater potential/ glacial till

R203047X68A BPA'S 800-KV D-C TRANSMISSION LINES

Portions of the 2 Pacific Intertie d-c lines built by the Bonneville Power Administration (BPA) are described; each constitutes 1/3 of the total length. The lines will have a capacity larger than any previous d-c line and a total length of over 800 mi, far greater than any existing a-c or d-c circuit. The first Pacific Intertie d-c line was designed without benefit of operating data from other overhead d-c lines, and similar operating data still were very limited when criteria were being formalized for the second line. The constructing agencies were forced to base criteria on test information collected at the BPA d-c test center, plus any deductions that could be based properly on a-c experience. The later scheduling of the second line allowed time for additional tests and studies. These tests suggested that criteria less conservative than those used on the first line could be adopted safely for the second, with some cost savings. Design criteria are tabulated and compared, and the derivations are examined. Has 15 references.

R203047X68A

Annestrand, S A; Harrington, E J; Marjerrison, M N; et al

800 KV DC TRANSMISSION LINES OF THE BONNEVILLE POWER ADMINISTRATION

Proc, Western Water Power Symp, pp D-35-D-52, Apr 1968. 18 p, 6 fig, 1 tab, 15 ref

Bonneville Power Administration, Portland, Oreg

DESCRIPTORS--/ *extra high voltage/ direct currents/ bibliographies/ transmission (electrical)/ *transmission lines/ design criteria/ costs/ extra long distance/ electric power/ electric insulation/ lightning/ radio interference/ clearances/ transmission towers/ safety/ design/ electrical grounding/ electrodes

IDENTIFIERS--/ electrical design/ electrical insulators/ overvoltage/ Pacific NW-SW Intertie/ overhead ground wire/ National Elec Safety Code

R203054X68A GENERATOR WINDING--PREVENTIVE MAINTENANCE
A program was developed for preventive maintenance on hydroelectric generator windings. The program is intended to provide a practical method for determining the condition and reliability of the winding insulation, revealing maintenance techniques necessary to lengthen the winding life, and sssuring reliable operation from 1 test and maintenance period to another. The annual maintenance check consists of: (1) a complete physical inspection; (2) a combination dielectric absorption and d-c overpotential test on winding, field, and exciter; (3) an a-c voltage drop test on field poles; (4) a high-current resistance test on field pole connections; and (5) a slot discharge test made immediately prior to shutdown. The program has been developed over the years and is the result of many investigations and trials of various test methods. Numerous adaptations have been extended to other areas such as rolling mill equipment, and the applicable experiences have been incorporated in the program. Has 19 references.

R203054X68A

Warren, Mead Jr and Butterworth, Chester I

A PREVENTIVE MAINTENANCE PROGRAM FOR HYDROELECTRIC GENERATOR WINDINGS

Inst Elec Electron Eng Trans Power App Syst, Vol PAS-87, No 5, pp 1283-1288, May 1968. 6 p, 7 fig, 2 tab, 19 ref, disc

Aluminum Company of America, Alcoa, Tenn

DESCRIPTORS--/ *maintenance/ *electric generators/ reliability/ leakage/ inspection/ *deterioration/ faults (electrical)/ bibliographies/ direct currents/ *electric insulation/ electrical coronas/ electric potential/ alternating currents/ *power O&M/ test procedures/ hydroelectric powerplants
IDENTIFIERS--/ *dielectric properties/ leakage current/ rotating machines/ overvoltage/ *windings (electrical)/ preventive maintenance/ stators

R203055X68A TVA'S RI EXPERIENCE ON 500-KV LINES
TVA began a comprehensive radio noise (RI) evaluation program in 1963 with a study of RI and radio field strengths (RIV) along the edge of transmission line right-of-way. Tests have included RI surveys with portable instruments covering the AM broadcast, FM, and TV bands; RI and RIV measurements in substations; and continuous recordings at 2 fixed RI stations. The tentative goal initially set for maximum RI 100 ft from TVA's 500-kv lines during fair weather was 50 microvolts/m (34 dB). Accumulated test data indicate that averages are below this level. The paper discusses instruments, antennas, and types of surveys; design and development of RI monitoring stations; and comparisons of the relative merits of various supplementary items. Results from RI profiles, RIV measurements, and monitor station recordings are analyzed and presented, along with brief discussions of signal-to-noise ratios and evaluation of TVA's transmission line design and construction techniques. All test procedures and evaluation methods have followed recommendations of the Radio Noise Subcommittee of the IEEE Transmission and Distribution Committee wherever applicable.

R203055X68A

Hartley, James W; Smith, Robert T; Dobson, Herbert I

TENNESSEE VALLEY AUTHORITY'S RADIO INTERFERENCE EXPERIENCES ON 500-KV TRANSMISSION LINES

Inst Elec Electron Eng Trans Power App Syst, Vol PAS-87, No 4, pp 903-911, Apr 1968. 9 p, 14 fig, 9 ref, disc

Tennessee Valley Authority, Chattanooga

DESCRIPTORS--/ *transmission lines/ *extra high voltage/ instrumentation/ *radio interference/ *noise/ weather/ antennas/ test procedures/ aging/ test facilities/ investigations/ electrical coronas/ contamination/ atmospheric precipitation/ electrical equipment/ rainfall

IDENTIFIERS--/ evaluation/ test results/ testing equipment/ signal to noise ratio/ electric conductors/ Tennessee Valley Authority

R203062X68A NUCLEAR POWER BUILDUP GOES CRITICAL
This paper reviews the chain reaction underway in nuclear powerplant construction, and the way power is assuming new importance in manufacturing, especially in the chemical industry. Utilities seek nuclear energy as the route to lower power costs, possibly 1 to 1.4 mils/kwh by 2020, compared with present costs of 3 to over 5 mils/kwh. Low-cost power can permit a freedom in development of new processes and in site selection heretofore unknown, and great savings can be made in processes presently using electricity. Low-cost power would furnish incentive to use electricity to perform many industrial processes in an energy-intensive manner; energy would be substituted for raw materials such as coke or natural gas, or for reducing high-quality ores having uneven or inconsistent geographic distribution. The projections of nuclear power's growth and low cost are based on performance of small plants now operating and estimates of plants under construction. Many estimates include plants existing only in the dreams of nuclear economists.

R203062X68A

Short, Herbert C

NUCLEAR POWER BUILDUP GOES CRITICAL

Chem Week, Vol 102, No 21, pp 44-61, May 1968. 18 p, 14 fig, 4 photo

Chemical Week, New York, N Y

DESCRIPTORS--/ *nuclear powerplants/ *nuclear energy/ industries/ cost comparisons/ costs/ manufacturing/ economics/ reviews/ chemistry/ coal/ public utilities/ safety/ forecasting/ electric power production/ electric power industries/ electric power demand/ energy

IDENTIFIERS--/ *nuclear engineering/ *nuclear power/ nuclear fuels/ nuclear reactors/ fossil fuels

R203087X78A RESULTS OF TESTS ON 400-KV LINES
During commissioning of the first 2 Czechoslovak 400-kv transmission lines, special attention was given to overvoltages occurring under normal and fault conditions. Purpose of the study was to obtain information for the future operation of the 400-kv system, and for establishing parameters to be demanded of power apparatus in the next stage of development of the ehv systems. Experimental work consisted of stage tests and investigations on a transient network analyzer. The following stage tests were made: switching a 400-mva autotransformer, at no load and when loaded with a compensating shunt reactor on the tertiary side; switching of 90-mvar shunt reactors; switching of 400-kv lines at no load; connecting and disconnecting one section of a 400-kv line to or from another energized section; switching a 400-kv line with an unloaded autotransformer connected to the receiving end; switching a 400-kv line with an autotransformer and a shunt reactor connected to the receiving end; switching an autotransformer/400-kv line block on the 220-kv side of the transformer, in different alternatives; single-pole switching of the transmission system; and switching a 400-kv line under line-to-ground fault conditions. Test results are given.

R203087X68A

Gert, Richard

RESULTS OF TESTS ON 400-KV TRANSMISSION LINES

Tech Digest, Vol 10, No 5, pp 291-298, May 1968. 8 p, 10 fig, 4 tab, 7 ref

Power Research Institute, Brno, Czechoslovakia

DESCRIPTORS--/ *extra high voltage/ *transmission lines/ *field tests/ power transformers/ experimental data/ electric power/ instrumentation/ test procedures/ circuit breakers/ transients/ electric currents/ power system operations/ electric potential/ alternating currents/ electric insulation/ faults (electrical)/ electrical stability/ coordination
IDENTIFIERS--/ *switching/ test results/ Czechoslovakia/ shunt reactors/ foreign research/ *network analysis/ switching surges/ overvoltage

R203104 68A VOLGOGRAD-DONBASS 800-KV D-C LINE

Experience in operating the 500-km, 750-mw, 800-kv, Volgograd-Donbass overhead d-c transmission line has been important in development of new, longer, higher voltage transmission lines in the USSR. Several contributions for creating reliable extra long and extra high voltage d-c transmission lines include: (1) analyzing the research and engineering solutions used in the design; (2) experience in adjusting and testing mercury arc valves and other special equipment; (3) control; (4) protection and automation; and (5) results of experimental investigations made on the transmission line. The design of the 2500-km, 1500-kv, 6000-mw Kasakhstan-Center d-c transmission line is based on these operating experiences. A discussion is included of: (1) series-connected valve bridges, (2) mercury-arc valves, (3) valve bridges, (4) automatic control, and (5) grounding. Recommendations are included for tower structures and line insulation.

R203104 68A

Berkovski, A M; Butaev, F I; Grois, E S; et al

OPERATING EXPERIENCE OF THE VOLGOGRAD-DONBASS DC TRANSMISSION LINE AND ITS APPLICATIONS TO EXTRA HIGH VOLTAGE DC HIGH CAPACITY TRANSMISSION

Pap, Int Conf Large High Tension Elec Syst, Paris, France, June 1968. 7 p, 3 fig, 4 ref

DESCRIPTORS--/ *extra high voltage/ extra long distance/ control/ field tests/ *transmission lines/ *direct currents/ transmission (electrical)/ foreign construction/ radio interference/ operations/ electric currents/ electric insulation/ transmission towers/ rectifiers/ electrical grounding/ automatic control/ converters (electrical)
IDENTIFIERS--/ *Volgograd-Donbass Line USSR/ USSR/ foreign research/ protection (electrical)

R203105 68A TRANSFORMER INRUSH CURRENT

Transformer inrush currents have caused difficulties principally in hvdc converter stations, but interference with relays and communication circuits also has been a problem. This report discusses the influence of various factors on the magnitude of inrush currents against a background of field tests, model tests, digital computer calculations, and analog computer measurements. After disconnecting a transformer the remanent flux is high in 2 of the phases. Under certain conditions delta windings appreciably reduce the zero-sequence components of inrush currents. Certain measures to reduce relay and communication problems are discussed. The effectiveness of preinsertion resistors is emphasized and rules for design of these resistors are given. Particular problems can arise in the case of 2 transformers with a common breaker, even when preinsertion resistors are used.

R203105 68A

Holmgrem, B; Jenkins, R S; Riubrugent, J

TRANSFORMER INRUSH CURRENT

Pap, Int Conf Large High Tension Elec Syst, Paris, France, June 1968. 13 p, 6 fig, 2 tab, 5 ref, 3 append

Swedish State Power Board and ASEA, Sweden

DESCRIPTORS--/ *power transformers/ extra high voltage/ communications/ direct currents/ *electric currents/ electric relays/ computers/ peak values/ circuit breakers/ electrical equipment/ field tests/ resistors/ calculations/ converters (electrical)/ magnetic fields/ investigations/ electric potential/ electrical grounding
IDENTIFIERS--/ foreign research/ Sweden/ flux density/ *transformer inrush current

R203106 68A DIRECT COOLING OF WATER-WHEEL GENERATORS

A large water-wheel generator, rated 225 mva at 200 rpm, and direct cooled with water in the stator winding, stator core, and rotor winding, has been commissioned by the Swedish State Power Board at the Seitevare Powerplant. Application of intensive cooling of this type provides an opportunity for making generators with higher outputs and optimizing the design relative to different parameters because of the requirements or economic evaluation of the system engineer and the plant designer. The total cost of the power station or pumped storage plant can be reduced when generator manufacturing costs are lowered and dimensions and weight of the generator can be adapted to the lowest building height, width, and crane capacity. Losses, reactances, and stored energy constant also can be influenced. Development work accomplished during the last 4 yr on direct water cooled units is reviewed.

R203106 68A

Tengstrand, C and Ronnevig, C

DIRECT COOLING OF WATER-WHEEL GENERATORS, INFLUENCE ON DIMENSIONS AND GENERATOR PARAMETERS

Pap, Int Conf Large High Tension Elec Syst, Paris, France, June 1968. 8 p, 4 fig, 2 tab

ASEA, Vasteras, Sweden

DESCRIPTORS--/ *hydroelectric power/ *electric generators/ economics/ losses/ *cooling water/ costs/ weight/ design criteria/ stress/ energy/ foreign design practices/ manufacturing/ moments of inertia/ *cooling/ magnetic properties

IDENTIFIERS--/ *rotors/ *stators/ Sweden/ Seitevare Pwrplt, Sweden/ reactance/ flux density

R203107 68A STUDY OF BUNDLED CONDUCTOR OSCILLATION

Great Britain's Central Electricity Generating Board conducted a study of conductor vibration in bundled conductor transmission lines on a test line in Scotland. A discussion is presented on: (1) mechanical configuration of the test line, (2) location, (3) conductor details, (4) instrumentation, and (5) data recording systems. Test results are tabulated and weather conditions at time data were obtained are given. Observations made between June 30, 1964 and Jan 14, 1965 are summarized. The test line provided valuable data on the behavior of 275- and 400-kv bundled conductor construction. Galloping occurred infrequently and only during winter months when temperatures were near freezing, snow was falling, and strong winds were blowing across the line. The galloping experienced on the bundled conductor lines was due to ice formation. Subconductor vibration, a serious problem difficult to prevent, occurs frequently and causes extensive damage to conductors and spacers. Using flexible damper spacers is the most hopeful approach to solving subconductor vibration.

R203107 68A

Rissone, R F; Aldham-Hughes, R R; Wilton, G S; et al

AN EXPERIMENTAL STUDY OF BUNDLED CONDUCTOR OSCILLATION

Pap, Int Conf Large High Tension Elec Syst, Paris, France, June 1968. 15 p, 6 fig, 3 tab, 5 ref

Central Electricity Research Laboratories and South of Scotland Electricity Board, Great Britain

DESCRIPTORS--/ *vibrations/ *vibration suppressors/ dampers/ ice loads/ *oscillation/ *transmission lines/ *bundled conductors/ aerodynamics/ wind (meteorology)/ field tests/ instrumentation/ mechanical properties/ photography/ experimental data/ analysis/ weather/ snow/ storms/ ice/ extra high voltage/ laboratory tests

IDENTIFIERS--/ *electric conductors/ *galloping conductors/ amplitude/ foreign research/ Great Britain/ *aeolian vibration

ELECTRICAL ENGINEERING

R203108 68A POLYETHYLENE-INSULATED HIGH-VOLTAGE CABLE
A simplified concept for design of insulated power cables for 115- to 138-kv operation is presented. The cables are insulated with a voltage-stabilized low-melt index polyethylene compound. Cable construction details, electrical ratings, dimensions, and other data are given for 4 underground and 1 submarine 115- to 138-kv installations. The insulant and the cables are evaluated based on data from voltage-time and load cycle tests. Heat fused methods are described for splicing cables and making end terminals. The 5 cable installations are discussed, with cable data, type of circuit and rating, installation, and operational data provided for each. Evaluation tests of these 5 installations demonstrate the practicability of 115- to 138-kv polyethylene-insulated power cables.

R203108 68A

Kenney, N D and Koulopoulos, M J

115 KV AND 138 KV POLYETHYLENE-INSULATED CABLE INSTALLATIONS AND CABLE EVALUATION DATA

Pap, Int Conf Large High Tension Elec Syst, Paris, France, June 1968. 12 p, 1 fig, 6 tab, 4 ref

Simplex Wire and Cable Co, Cambridge, Mass

DESCRIPTORS--/ *electric cables/ *electric insulation/ *polyethylenes/ electric power/ electric potential/ shielding/ dielectrics/ circuits/ test procedures/ installation/ operations/ power system operations/ electric currents/ electrical properties/ transmission (electrical)/ losses
IDENTIFIERS--/ buried cables/ *underground cables/ *submarine cables/ electric conductors/ cable terminations/ evaluation

FOUNDATIONS

R203035X68A PILE FOUNDATION ANALYSIS
Analysis of pile foundations is accomplished by calculation of the stiffness influence coefficients. Piling loads and deflections can be determined, as well as the principal frequencies. Axial and torsional elastic constants for a pile may be adjusted to the physical problem; the torsional constant has negligible effect and usually may be ignored. The elastic constants dependent on bending may be derived in several ways including tests or physical models based on an assumed behavior of the system such as: (1) a semi-infinite beam on an elastic foundation, (2) a free cantilever fixed at an assumed depth, or (3) a free cantilever fixed to a semi-infinite beam on an elastic foundation. The stiffness influence coefficients may be formed from simple matrices defining elastic constants and position or from a list of equations. Has 28 references.

R203035X68A

Saul, William E

STATIC AND DYNAMIC ANALYSIS OF PILE FOUNDATIONS

Proc Amer Soc Civil Eng, J Struct Div, Vol 94, No ST5, pp 1077-1100, May 1968. 24 p, 7 fig, 6 tab, 28 ref, 4 append

DESCRIPTORS--/ *pile foundations/ *piles/ structural engineering/ pile driving/ live loads/ *structural analysis/ elastic deformation/ dead loads/ dynamics/ computer programming/ deflection/ bibliographies/ analysis/ foundations/ lateral forces/ stiffness

IDENTIFIERS--/ elastic foundations/ pile tests

R203040 68A REVIEW OF TUNNEL SITE INVESTIGATIONS
The engineering geology profession faces a formidable challenge in providing designers and builders of tunnels with: (1) precise geological knowledge of tunnel sites, (2) effects of geologic conditions, (3) quantities of water and gas to be encountered, (4) strength and stability of the rock, and (5) support and lining requirements. This paper reviews current methods of producing required data on the tunnel site in the preconstruction stage. Consideration is directed toward constructing a free-flow tunnel in fractured rock formations without any requirements for the rock-mechanics type of in situ tests usually made for pressure tunnels or large underground openings. Preliminary office studies, on-site investigations, geophysical surveys, drill holes, exploration excavations, and laboratory tests are discussed. Factors involved in making geologic predictions include physical obstacles and shortage of time and money. Experience indicates present technology is not used fully, and a more realistic allocation of time, money, and qualified personnel is required to achieve the best results. The immediate opportunity for improvement of those results relies more on developing men whose judgment determines the answer and less on developing additional tests for seemingly precise data on minute samples. Has 15 ref.

Gardner, William I R203040 68A

TUNNEL SITE INVESTIGATIONS--A REVIEW

Pap, Conf Tunnel Shaft Excavation, Univ Minnesota, Minneapolis, May 1968. 12 p, 15 ref

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ bibliographies/ *engineering geology/ geology/ *geologic investigations/ *subsurface investigations/ petrographic investigations/ *tunnels/ tunnel design/ tunnel construction/ explorations/ geophysics/ drill holes/ rock excavation/ rocks/ mapping/ ground water/ training/ reviews/ laboratory tests
IDENTIFIERS--/ *site selection/ rock properties/ *tunnel supports/ geologic maps/ geologic defects

R203078 68A EARTHQUAKES IN WESTERN STATES
Earthquake maps of the Western United States, including Alaska and Hawaii, were prepared showing epicenter locations and earthquake intensities. Data were assembled by the Bureau of Reclamation from U S Coast and Geodetic Survey publications and compiled as a reference on relative seismicity of the western states. The report does not contain information for estimating structural loadings produced by earthquake vibrations. Earthquake intensity and magnitude scales are explained. Ten maps are included.

Anon R203078 68A

EARTHQUAKE IN WESTERN UNITED STATES

Bur Reclam Dams Br Rep DD-8, Apr 1968. 23 p, 10 fig, 3 tab, 2 ref

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ *earthquakes/ seismic design/ seismic investigations/ *seismology/ geophysics/ engineering geology/ vibrations/ scale/ maps/ intensity/ design criteria

IDENTIFIERS--/ earthquake engineering/ earthquake focus/ *earthquake zones/ *epicenters/ magnitude/ Western United States/ Alaska/ Hawaii

R203123X67A A DESERT GLOSSARY
A compilation of current terms describing desert features and desert phenomena is presented. An attempt was made to simpligy and consolidate the terminology used in describing deserts. Entries in the glossary were largely physiographic and geographic, but botanical, pedological, meteorological, climatological and several archaeological terms are included. The glossary is presented in two parts. In the first section, which is the more complete, the deserts of Mexico and the United States are grouped together. The second section consists of terminology applied to deserts in Arabia, Australia, Central Asia, Chile and Peru, Egypt, Iraq, Jordan, Pakistan, Iran, Southwest Africa, and Syria. Has 32 references.

R203123X67A

Stone, Richard O

A DESERT GLOSSARY

Eath-Sci Rev, Vol 3, No 4, pp 211-268, Dec 1967. 58 p, 37 fig, 32 ref

University of Southern California, Department of Geology, Los Angeles

DESCRIPTORS--/ dune sands/ plant (botany)/ alluvial deposits/ *arid lands/ dunes/ Southwest U.S./ soils/ meteorology/ climatology/ plants/ geomorphology/ bibliographies/ weathering/ *deserts/ geology

IDENTIFIERS--/ *glossaries

R203142 68A BURRO MOUNTAIN ULTRAMAFIC BODY
The author describes the lithology, structure and emplacement of the Burro Mountain body in the Santa Lucia Range, California located about 60 mi southeast of Monterey Bay. This body forms a block 1 x 1.5 mi on a side, is typically ultramafic in character, and consists of approximately 65% peridotite, 35% dunite and less than 1% pseudopyroxenite. It is emplaced in highly sheared Franciscan terrane west of Nacimiento fault. The fault separates 2 major structural units: on the east a 40- by 300-mi block with a basement of granitic rock, schists and gneisses, and on the west a 10- by 100-mi tract of Franciscan Formation. The area was chosen for study because of the excellent exposures and a steep gorge transecting the center of the body which revealed the internal structure. In addition to field mapping some 270 oriented cores were secured--using a portable drill--that represented every ultramafic lithology along a 2-mi traverse through the body. Serpentinization was nearly complete near the margins of the body and decreased toward the center. Evidence suggests a subcrustal origin for the primary ultramafic rock. Has 32 references.

R203142 68A

Burch, Stephen H

TECTONIC EMPLACEMENT OF THE BURRO MOUNTAIN ULTRAMAFIC BODY, SANTA LUCIA RANGE, CALIFORNIA

Geol Soc Amer Bull, Vol 79, No 5, pp 527-537, May 1968. 15 p, 3 fig, 4 plate, 2 tab, 32 ref

Geological Survey, Menlo Park, Calif

DESCRIPTORS-/ geological surveys/ petrographic investigations/ cores/ metamorphic rocks/ serpentine/ core drilling/ granites/ schists/ *petrology/ *igneous rocks/ geology/ geologic formations/ geologic investigations/ bibliographies/ mineralogy/ structural geology

IDENTIFIERS-/ Santa Lucia Range, Calif/ Burro Mountain, Calif/ *ultrabasic rock/ peridotite/ tectonics

R203147 67A GAMMA-GAMMA LOGGING OF DRILL HOLES

Gamma-gamma drill hole logging measures the intensity of scattered gamma radiation in rock irradiated by a gamma source. Such logging can be used to determine quantitatively the density of the rock and its lithology and porosity. The scattered gamma radiation is a function of several parameters: (1) rock density, (2) density of the drill hole fluid, (3) radius of the drill hole, (4) shielding of the iron jacket of the gamma ray detecting device used in the drill hole, and (5) distance between the gamma ray source and the detector. The relationship between the gamma ray intensity and the density of the rock is determined by a diffusion equation for the absorbing medium. This equation and other equations required are presented and discussed in detail.

Diad'kin, I G

R203147 67A

ON THE THEORY OF GAMMA-GAMMA LOGGING OF DRILL HOLES

Bur Reclam Transl 710, July 1967. 17 p, 2 fig, 7 ref

Bureau of Reclamation, Denver, Colo

DESCRIPTORS-/ *logging/ *gamma rays/ radiation measurement/ density/ drill holes/ boreholes/ geophysics/ geologic investigations/ diffusion/ engineering geology/ subsurface investigations/ scattering/ radioactive well logging/ borehole geophysics

IDENTIFIERS-/ rock properties/ Compton scattering/ gamma probes/ well logging/ *gamma-gamma logging

R203148 67A SIGNALS RECORDED IN DEEP SEISMIC SOUNDING

Experimental data on useful signal magnitudes for longitudinal waves recorded in deep seismic soundings (DSS) are summarized. Standard explosive charges of 130 kg of TNT for measurements at sea and 1000 kg of TNT for seismic work on land were used. The most sensitive parameter of seismic waves was found to be their amplitude which can now be measured in absolute units of displacement, velocity, or pressure. This permits comparison of results in different geographic areas and with different seismic apparatus. A strict calibration of the seismic channel is required. Signals observed in DSS and in (earthquake) seismology can be compared and the possibilities of combining the 2 approaches considered. Combined use of explosive charges and small earthquakes (microseisms) in seismic observations may significantly extend the scope of both methods and impart to them the detail of DSS and the depth of seismological (microseismis) measurements. Data can also be secured from nuclear detonations. Has 27 references.

Kosminskaya, I P and Galkin, I N

R203148 67A

THE SIGNALS RECORDED IN DEEP SEISMIC SOUNDING

Phys Solid Earth, No 10, pp 627-633, Oct 1967. 7 p, 2 fig, 2 tab, 27 ref

DESCRIPTORS-/ *seismic investigations/ *seismic waves/ *seismology/ earthquakes/ explosions/ detonation/ *geophysics/ geophones/ soundings/ longitudinal waves/ explorations/ subsurface investigations/ bibliographies/ foreign research

IDENTIFIERS-/ seismic tests/ amplitude/ *wave propagation/ USSR

R203233 68A ANALYSIS OF STRESSES CAUSING LAND SUBSIDENCE

Land subsidence in areas of intensive groundwater withdrawal is attributed to compaction of deposits caused by increased loading stresses. Record subsidence has been produced in the San Joaquin Valley, California, where accelerated pumping of groundwater for irrigation with consequent large water-level decline has resulted in as much as 26 ft of settlement since 1930. As demonstrated, subsidence is related directly to effective-stress changes computed from water-level data, both unconfined (water table) and confined (artesian). If porosity is 40%, 1-foot water-table rise would cause 0.4-foot increase in effective stress whereas 1-foot artesian head decline would cause 1-foot increase in effective stress. Effective stresses are changed in 2 principal ways: (1) Water-table fluctuations change the buoyant support of sand grains, and (2) a change of the water table or piezometric head, or both, may induce hydraulic gradients and seepage stresses in the deposits. These stress changes are additive in their effect, and together cause compaction.

R203233 68A

Lofgren, Ben E

ANALYSIS OF STRESSES CAUSING LAND SUBSIDENCE

Geol Surv Prof Pap 600-B, pp B219-B225, 1968. 7 p, 4 fig, 5 ref

Geological Survey, Sacramento, Calif

DESCRIPTORS--/ *land subsidence/ compaction/ aquifers/ water table/ effective stress/ artesian wells/ aquicludes/ seepage/ porosity/ *water level fluctuations/ California/ confined water/ hydrostatic pressure/ hydraulic gradient/ irrigation effects/ hydrogeology/ *irrigation wells/ aquitards/ pumping
IDENTIFIERS--/ piezometric head/ San Joaquin Valley, Calif

R203270 67A POROSITY AND PERMEABILITY OF CURDSVILLE LIMESTONE

Factors controlling porosity and permeability of the Curdsville Limestone Member of the Lexington Limestone of Middle Odovician Age in the Blue Grass Region, Ky are geological. Microstratigraphic analysis had led to division of the lower Lexington Limestone, consisting principally of the Curdsville Member into 3 beds which may be subdivided into zones made of several lithologic types and subtypes. Lower, middle, and upper bed characteristics are helpful in determining regional depositional history. Paleogeography of Curdsville time has been determined by delineation of 2 local facies: (1) a carbonate bank--shoal area facies, and (2) a shelf--channel area facies. Ground waters of meteoric origin have created sink holes, solution valleys, and caverns through solution enlargement of fractures comprising an extensive intersecting joint system. Detailed examination of the Bryantsville Quadrangel on the Jessamine Dome Shoal Area indicates fracture traces such as sink hole, solution valley, and stream channel alignments are controlled mainly by nearly vertical joints in the Curdsville and underlying Tyrone Limestones. High frequency and intersection of joint fractures may indicate presence of permeable limestone aquifers at shallow depth. The hypothesis can be tested by drilling several wells.

R203270 67A

MacQuown, William C, Jr

FACTORS CONTROLLING POROSITY AND PERMEABILITY IN THE CURDSVILLE MEMBER OF THE LEXINGTON LIMESTONE

Res Rep 7, Univ Kentucky, 1967. 80 p, 29 fig, 7 tab, 13 ref, 5 append

University of Kentucky, Lexington

DESCRIPTORS--/ porosity/ permeability/ aquifers/ water yield/ springs/ wells/ faults (geology)/ limestones/ groundwater movement/ subsurface waters/ rock properties/ spring waters/ fractures (geology)/ carbonate rocks/ joints (geology)/ Karst/ sinks/ Kentucky

IDENTIFIERS--/ Blue Grass Region, Ky

R203037X68A WATER-HAMMER CONTROL IN PUMP SYSTEMS
Charts are presented for use in designing valve-closure programs to minimize water-hammer effects caused by power failure in centrifugal pump systems. The valve-closure program consists of 2 parts: rapid closure to a specified opening at the time of flow reversal, followed by linear motion to full closure during a period of 5 time intervals following flow reversal. A chart is presented for use in determining the maximum head at the pump that will accompany such a closure program. Other techniques of water-hammer control and their limitations are discussed. The generality of the results impairs their accuracy when applied to particular systems. The results presented are useful for designing a valve-closure program as a starting point in a graphical or numerical analysis. However, an accurate prediction of the expected overpressure must be obtained from an analysis of the system using the actual valve and, if possible, pump characteristics.

Kinno, Hitoshi

R203037X68A

WATER-HAMMER CONTROL IN CENTRIFUGAL PUMP SYSTEMS

Proc Amer Soc Civil Eng, J Hydraul Div, Vol 94, No HY3, pp 619-639, May 1968. 21 p, 10 fig, 2 tab, 8 ref, 2 append

Tokushima University, Tokushimashi, Japan

DESCRIPTORS--/ *water hammer/ *centrifugal pumps/ *hydraulic gates and valves/ *pumps/ failure (power)/ hydraulic transients/ surges/ flow/ pressures/ foreign design practices/ graphical analysis/ *control systems/ *control

IDENTIFIERS--/ *valve vibration/ Japan/ flow characteristics/ water column separation

R203038X68A FLOW IN BUTTERFLY AND SPHERICAL VALVES
Discharge coefficients of butterfly and spherical valves were obtained from tests of 10-in.-dia models. Four lenticular-shaped butterfly valve discs were tested, and in one test the valve disc was offset in relation to the shaft centerline. Four spherical valve rotors were tested. The data can be used to predict the flow and torque for a given set of conditions as illustrated in numerical examples. In testing spherical valve models, hydrodynamic force on the valve was measured. The data can be used to size the trunnions of such valves. The tests were conducted with air as working fluid, and results can be applied to flow of liquids provided cavitation does not occur.

Guins, Vsevolod G

R203038X68A

FLOW CHARACTERISTICS OF BUTTERFLY AND SPHERICAL VALVES

Proc Amer Soc Civil Eng, J Hydraul Div, Vol 94, No HY3, pp 675-690, May 1968. 16 p, 20 fig, 7 ref, 2 append

Westinghouse Electric Corp, Sunnyvale, Calif

DESCRIPTORS--/ *butterfly valves/ *discharge coefficients/ torque/ test procedures/ hydraulics/ cavitation/ characteristics/ *flow/ velocity/ head losses/ test facilities/ pressure conduits/ fluid flow/ *hydraulic gates and valves

IDENTIFIERS--/ *spherical valves/ hydraulic design

R203039X68A FALL VELOCITY OF IRREGULAR SHAPED GRAINS
Determination of free-fall velocity of irregularly shaped particles in viscous fluids is presented. Mathematical expressions for irregularly shaped particles such as naturally worn sediment particles are not obtained easily and do not include pertinent particle measurements of surface area and volume in the shape factor. A shape factor is proposed correlating Reynolds number with the drag coefficient to describe the motion of irregular shapes. This shape parameter results in a useful Reynolds number-drag coefficient relation. Analysis data were collected from tests of natural gravel-size particles of various shapes and sizes, supplemented by larger regular geometric shapes. The basic motions of a particle in free-fall are classified and analyzed considering causes such as flow separation and vortex formation.

R203039X68A

Alger, George R and Simons, Daryl B

FALL VELOCITY OF IRREGULAR SHAPED PARTICLES

Proc Amer Soc Civil Eng, J Hydraul Div, Vol 94, No HY3, pp 721-737, May 1968. 17 p, 11 fig, 4 tab, 6 ref, 2 append

Michigan Technological University, Houghton; Colorado State University, Fort Collins

DESCRIPTORS-- / *sedimentation/ sediments/ *free fall/ drag/ fluid flow/ fluid mechanics/ Reynolds number/ viscosity/ shapes/ *particle shapes/ particle size/ particles/ *grain shapes/ grain sizes/ vortices/ motion/ hydraulics/ circulation/ liquids/ fluids/ gravels/ velocity/ settling velocity

IDENTIFIERS--/ separation/ surface area/ *shape factor

R203042 68A TRANSDUCER MEASURES OPEN CHANNEL FLOW
Laboratory studies of open channels, especially scale models of rivers and estuaries, require determination of water levels and magnitude and direction of current. The instrument described in this paper has been designed for remote measurement of simultaneous values of water level, current velocity, and current direction. The drag and buoyancy forces on a vertical cylinder are transferred to 3 springs with a full strain gage bridge mounted on each. Simple relationships exist between the 3 bridge outputs and the 3 variables required, enabling a suitable calibration to be made. The application to an estuary model is described and future developments are mentioned. The instrument is capable of measuring speeds within the range of 2 to 10 in./sec (5 to 25 cm/s) with an accuracy of plus or minus 10%, while directions are given to plus or minus 5 deg and water surface levels to plus or minus 1/20 in. (plus or minus 1 mm).

R203042 68A

Townson, J M

A TRANSDUCER FOR OPEN CHANNEL FLOW

J Hydraul Res, Vol 6, No 1, pp 45-68, 1968. 24 p, 13 fig, 2 plate, 5 ref

University of Aberdeen, Great Britain

DESCRIPTORS--/ instrumentation/ *water measurement/ velocity/ water currents/ circuits/ *transducers/ calibrations/ *electronic equipment/ drag/ computers/ *strain gages/ damping/ current meters/ models/ open channel flow/ hydraulics/ laboratory equipment/ laboratory tests

IDENTIFIERS-- / bridges (electric)/ accuracy/ foreign research/ Great Britain

R203046X68A HYDRAULIC DESIGN OF LARGE SIPHONS

Siphon structures will be built at the end of several pumping plant discharge lines on the California Aqueduct. These structures terminate below the water surface of the receiving canal and are designed to prevent backflow when the main pumps are not operating. Parameters considered in the hydraulic design of these siphons include: (1) upslope, (2) downslope, (3) bend radius, (4) crest radius and elevation, (5) expanding transition, and (6) minimum tailwater. Additional problems associated with siphons are air accumulation and removal, particularly in the crown. As accumulation rates are difficult to estimate, a minimum clearing velocity is suggested for making this determination.

R203046X68A

Johnson, William K

HYDRAULIC DESIGN OF LARGE SIPHONS

Proc, Western Water Power Symp, pp B-119-B-124, Apr 1968. 6 p, 1 fig, 2 tab, 13 ref

PMT Associates, Inc, Sacramento, Calif

DESCRIPTORS-/ *hydraulic structures/ hydraulic jumps/ slopes/ losses/ *siphons/ transition zones/ transitions (structures)/ friction/ energy losses/ bubbles/ vibrations/ vacuum/ stilling basins/ pumping plants/ air/ operation and maintenance/ energy dissipation

IDENTIFIERS- / *hydraulic design/ California aqueduct/ California/ hydraulic properties

R203050X68A TEHACHAPI PUMPING PLANT INTAKE STRUCTURES

The Tehachapi Pumping Plant will provide the major lift of water carried by the California Aqueduct from Northern California over the Tehachapi Mountains to Southern California. The 14 pumps will have design discharge of 4,100 cfs at approximately 1,940 ft head. Detailed hydraulic model studies of several alternative designs were performed to select an adequate configuration for the pumping plant intake area. Investigations were conducted on the effects of various pump manifold arrangements on energy losses. A dimensionless loss coefficient was used to establish the energy balance for junction systems with multiple-flow input elements. Studies performed for selection of the intake transition and manifold configurations are discussed. Other investigations are being conducted to determine optimum combinations of pumping units for minimum overall energy losses and assessment of the action of pressure fluctuations in creating fluttering conditions at manifold junctions.

R203050X68A

Amorocho, J; DeVries, J J; Curry, W

HYDRAULIC STUDIES OF THE TEHACHAPI PUMPING PLANT INTAKE CHANNEL AND MANIFOLD

Proc, Western Water Power Symp, pp B-19-B-34, Apr 1968. 16 p, 11 fig, 1 tab, 5 ref

University of California, Davis; California State Department of Water Resources, Sacramento

DESCRIPTORS-/ hydraulic models/ hydraulics/ *pumps/ energy losses/ model tests/ *intake structures/ pumping plants/ discharges/ vortices/ *pump intakes/ turbulent flow/ vibrations/ efficiencies/ resonance/ Reynolds number/ safety/ transitions (structures)/ economies

IDENTIFIERS-/ *manifolds/ Tehachapi Pump Plant, Calif/ hydraulic design/ California Aqueduct/ *splitters/ California State Water Proj/ California

R203064 68A THERMAL METHODS OF FLOW MEASUREMENT

The article reviews the principles of velocity and mass-flow measurement by heat transfer methods and the difficulties encountered in applying these principles. The review is not an assessment of different types of currently available commercial apparatus. Heat loss from a sensing element and use of heat as a tracer are discussed. Measurable flow quantities include: (1) local mean velocity, (2) mass flow, (3) surface shear stress, and (4) velocity fluctuations. Heat loss characteristics of heated-element anemometers and effects of orientation, ambient temperature, and contamination are reviewed. A bibliography is included listing 62 references to literature surveys, recent research papers, and key papers describing the basic principles.

R203064 68A

Bradshaw, P

THERMAL METHODS OF FLOW MEASUREMENT

J Sci Instrum, Ser 2, Vol 1, pp 504-509, May 1968. 6 p, 62 ref

National Physical Laboratory, London, Great Britain

DESCRIPTORS-- / flow/ *fluid flow/ fluid mechanics/ hydraulics/ gases/ bibliographies/ liquids/ fluids/ *hot film anemometers/ thermocouples/ *hot wire anemometers/ *anemometers/ turbulence/ *turbulent flow/ pitot tubes/ thermistors/ thermal conductivity/ contamination/ heat transfer/ measuring instruments/ calibrations/ *discharge measurement/ flow meters
IDENTIFIERS-- / *flow measurement/ rotameter

R203077 68A PRESSURE PULSATIONS IN POWERPLANTS

A hydraulic model of the Krasnoiarsk hydroelectric power station was studied to determine effects of operating a unit at heads lower than rated value. Operations will begin before the reservoir is completely filled to produce additional electric energy. The hydraulic assembly unit is modeled according to Froude with a 1:30 scale. A general diagram of the model is given. The model was studied with rpm ranging from 10-15% lower than optimum efficiency speed to runaway speeds. The study verified that pulsations behind the rotor mainly depend on rpm of the turbine and the results agree with well-known empirical formulas. Pressure pulsation amplitudes in the penstocks were 4 to 5 times smaller than corresponding amplitudes in the rotor chamber. Other pulsations were observed at rotation frequency and at higher frequencies. These pulsations reached their greatest range at maximum discharges and at starting rpms.

R203077 68A

Grigor'ev, V I and Tananaev, A V

ON THE STUDY OF PRESSURE PULSATIONS IN THE FLOW CHANNEL OF THE KRASNOIARSK HYDROELECTRIC POWER STATION HYDRAULIC ASSEMBLY UNIT MODEL

Leningrad Politekh Inst, No 274, pp 7-11, 1966. Transl from Russ, Joint Publ Res Serv Transl 739, June 1968. 7 p, 4 fig, 1 ref

DESCRIPTORS--/ pressure sensors/ pressures/ pressure measuring equip/ *hydroelectric powerplants/ hydraulic transients/ hydraulics/ models/ model tests/ turbines/ penstocks/ *hydraulic models/ surges/ hydraulic machinery/ water hammer/ rotating components/ *pulsating flow

IDENTIFIERS--/ Krasnoiarsk Powerplant USSR/ foreign research/ hydraulic design/ hydraulic pressure

R203098X68A HYDRAULIC TRANSIENTS IN PUMPING PLANTS

Computational procedures for analyzing hydraulic transients in pump discharge lines with electric motor-driven pumps have been known for many years. Although the mechanics of computing hydraulic transients in pump discharge lines have advanced rapidly, several unusual troublesome aspects exist. This paper has a threefold purpose in bringing some of these aspects to the reader's attention: (1) practical and unusual aspects of hydraulic transients in pumping plants are discussed; (2) attention is given to available water-hammer solutions in engineering literature providing a ready solution of the hydraulic transients in pumping plants for many water-hammer control devices; and (3) observed and computed transients in pumping installations with various types of pressure control devices are discussed. Many water-hammer control devices for pumping plants are available, and a choice of the most suitable device can be narrowed to a few practical alternatives. Prior knowledge of available water-hammer solutions for these devices will reduce computational work necessary to determine critical hydraulic transient effects.

R203098X68A

Parmakian, John

UNUSUAL ASPECTS OF HYDRAULIC TRANSIENTS IN PUMPING PLANTS

J Boston Soc Civil Eng, Vol 55, No 1, pp 30-47, Jan 1968. 18 p, 10 ref

DESCRIPTORS--/ *hydraulic transients/ *water hammer/ *pumping plants/ fluid flow/ velocity/ pressures/ control/ pipelines/ failure (power)/ wave velocity/ surge tanks/ electric power failures/ check valves/ air chambers/ hydraulics/ kinetic energy/ analysis/ hydraulic machinery/ specific speed
IDENTIFIERS--/ *discharge lines/ water column separation/ hydraulic design

R203101 68A TURBINE INLET FLOW RATE AND PRESSURE DROP

Regular supervision of the operating parameters of hydrogenerators and rational management in operating a powerplant will increase annual production 8 to 10%. With output N, head H, and flow rate Q known for each operating condition of a unit, the degree of utilization of the turbine output capacity can be established and compared with one attainable under given hydraulic conditions. With H, Q, and N known, appropriate turbine control is possible, and water consumption per unit of power produced may be minimized. Operationally, checking the energy characteristics of hydraulic turbines after overhaul is important. Knowledge of H, Q, and N is indispensible for acceptance tests and is the basis for assessing the overhaul effect. Measuring output N and head h is simple; however, measuring flow rate Q is not easily accomplished. Several methods for continuously measuring flow rate and the accuracy obtained are discussed. A basic interrelation exists between flow rate Q and pressure drop delta h in the turbine spiral case. This paper reviews problems in determining Q by measuring the pressure drop in the spiral case. Has 33 references.

R203101 68A

Steller, Kazimierz

ON THE INTERRELATION BETWEEN FLOW RATE IN A HYDRAULIC TURBINE AND PRESSURE DROP IN THE INLET SCROLL OF A CIRCULAR CROSS SECTION

Pr Inst Masz Przeplyw, No 25, pp 31-63, 1965. Transl from Pol, Tech Transl 67-56059, 1968. 30 p, 14 fig, 2 tab, 33 ref

DESCRIPTORS--/ *hydraulic turbines/ *spiral cases/ hydraulics/ errors/ *discharge measurement/ flow control/ hydroelectric powerplants/ fluid flow/ experimental data/ bibliographies/ acceptance tests/ measurement/ hydraulic machinery/ investigations/ research and development/ water measurement/ power O&M/ *turbines/ calculations
IDENTIFIERS--/ foreign research/ Poland/ *Winter-Kennedy method/ *accuracy

R203238X68A RELATION OF ALLUVIAL CHANNEL RESISTANCE TO BED FORM
Existing data from flume tests over ripple and dune beds are used to study the relation of flow to shear velocity. It is concluded that resistance to flow is related to the stages of development of the ripples or dunes, resistance being greatest at their maximum stages of development. For ripples, the maximum stage of development, for bed material of a given size, occurs at the same shear velocity, irrespective of depth. For dunes, the maximum development occurs at the same value of average velocity/shear velocity and is approximately independent of depth. However, plots of flume data show that, for greater depths, maximum resistance occurs at greater shear velocities, hence at greater average velocities. Application of the results to data from 3 West Pakistan canals show similar flow characteristics, but only over a small part of the dune where range bed resistance is less than maximum. It is suggested that more extensive observations should be made on the dimensions of ripples and dunes and their solution to flow conditions.

R203238X68A

Smith, Kenneth V H

ALLUVIAL CHANNEL RESISTANCE RELATED TO BED FORM

Proc Amer Soc Civ Eng, J of Hydraul, Vol 94, No HY1, Pap 5720, pp 59-69, Jan 1968. 11 p, 8 fig, 1 append

Southampton University, Great Britain

DESCRIPTORS--/ *hydraulics/ flumes/ laboratory tests/ fluid friction/ *flow resistance/ canals/ *open channel flow/ *streambeds/ velocity/ *alluvial channels/ channel flow/ boundaries (surfaces)/ flow rates/ dunes/ currents (water)/ artificial watercourses/ average flow/ bed load/ roughness (hydraulic)/ sand waves
IDENTIFIERS--/ *bed resistance/ average velocity/ bed ripples/ bed roughness

R203245X68A LAMINAR FLOW IN FINITELY WIDE RECTANGULAR CHANNELS
Experimental investigations in rectangular channels with width-to-depth ratios ranging from 2.74:1 to 100:1 confirm the Boussinesq solution of Poisson's equation for 2-dimensional flow. Velocity distribution measurements indicate that errors associated with surface tension and air friction may be negligible in comparison to channel irregularities and errors in measurement. A side-wall function, F sub BY, is defined as the ratio of average velocity in a finitely wide channel to that in an infinitely wide channel. Introduction of F sub BY into the equations for the friction factor and Reynolds number allows comparison of experimental data corrected to what would occur in an infinitely wide channel. Use of the side-wall function is invalid for flows in which the Reynolds number is greater than 800.

R203245X68A

Woerner, Jack L; Jones, Benjamin A, Jr; Fenzl, Richard N

LAMINAR FLOW IN INFINITELY WIDE RECTANGULAR CHANNELS

Amer Soc Civ Eng, J Hydraul Div, HY3, pp 691-704, May 1968. 14 p, 6 fig, 5 tab, 11 ref, 2 append

Land Authority of Puerto Rico, Santurce; University of Illinois, Urbana; State University of New York, Syracuse
DESCRIPTORS--/ *hydraulics/ *laminar flow/ *open channel flow/ banks/ *velocity/ Reynolds number/ *fluid friction/ roughness (hydraulic)/ channel morphology/ spatial distribution

IDENTIFIERS--/ friction factors/ *velocity distribution/ rectangular channels

R203260 67A DIFFERENCE SOLUTIONS OF THE SHALLOW-WATER EQUATION
The quasi-linear partial differential equations known as the shallow-water equations describe the flow of water in open channels or over sloping planes (overland flow). Because no analytic solution exists for these equations, finite-difference methods must be used to obtain solutions. Formulation of finite-difference schemes involves consideration of the convergence of the finite-difference solutions to the true solution of the equation. A theoretical examination of the approximation of several difference operators, both implicit and explicit, is presented and the stability of these schemes is examined empirically for flow over a plane with critical depth downstream boundary condition and a zero inflow upstream boundary condition. A finite-difference scheme based on the method of characteristics was found to be satisfactory in many cases. Explicit methods were found to be not suitable for this problem except in some special cases. Has 19 references.

R203260 67A

Liggett, James A and Woolhiser, David A

DIFFERENCE SOLUTIONS OF THE SHALLOW-WATER EQUATION

Tech Rep 6, Cornell Univ, Aug 1967. 33 p, 14 fig, 1 tab, 19 ref, append

Cornell University, Ithaca, N Y

DESCRIPTORS--/ *computers/ *engineering mechanics/ finite-differences/ hydraulics/ *open channel flow/ flow/ *fluid flow/ shallow water/ *overland flow

IDENTIFIERS-/ shallow-water equation

R203275 68A TAINTER GATES AS FLOW MEASURING DEVICES
This is a Final Report on an intensive study of the feasibility of using Tainter gates as flow measuring devices. Effective use, control, and management of water resources usually requires both flow-control devices and flow measurements. Hydrologic studies on agricultural watersheds involve flows through drainage channels. Basic information on methods of flow control and measurement of flow quantities over and through control structures is of utmost economic importance in design and maintenance of stable channels in erodible soils. Soil and water conservation activities in the Southern Florida Flatwoods, have utilized Tainter gates for the purpose of stream flow control A study of existing control structures was coupled with hydraulic model studies to enhance design of Tainter gates, investigate use of such gates as flow measuring devices, adapt remote sensing devices for recording pertinent field data, and develop a computer program to translate periodic recordings into discharge rates. Hydraulic models of 2 typical installations were built and tested. Model results were in accord with available field measurements. A parametric formulation of pertinent variables was possible and extension of model data to prototype field performance promises to yield quite accurate indirect flow measurements.

R203275 68A

Mayer, Paul G and Olmstead, Bruce R

HYDRAULIC INVESTIGATIONS OF TAINTER GATES AS FLOW MEASURING DEVICES

Water Resour Center Rep, Georgia Inst Technol, Apr 1968. 103 p, 30 fig, 9 tab, 3 append

Georgia Institute of Technology, Atlanta

DESCRIPTORS--/ *radial gates/ *water measurement/ *flow control/ model tests/ *hydraulic models/ analysis/ laboratory tests/ digital recording systems/ laboratory equipment/ recording systems/ hydraulics/ hydraulic gates and valves/ hydraulic gates/ *flow measurement/ investigations/ *discharge measurement
IDENTIFIERS--

R203013X67A SEDIMENT SETTLING & HEAD LOSS IN CONDUITS
This report includes 2 reprints: (1) When investigating the sediment transport problem, important information must include not only the grain size diameter, but the rate of fall of the particles through water. The article informs the reader of important studies on the settling of natural grains. These particles are usually odd-shaped; available knowledge on spherical particles does not always give the most accurate information on natural grains; (2) The object of this investigation was to determine the magnitude of head losses caused by the conveyance of solid-liquid mixtures through circular conduits of variable slopes. The study concentrated on the problem of transporting the mixtures in complete suspension, i.e., so that none of the solid particles settle to the bottom of the pipe. Even within the transport problem of complete suspension, a distinction between homogeneous and heterogeneous suspensions must be made. A homogeneous suspension is possible only if solid distribution is uniform over the pipe cross section. In the case of heterogeneous suspensions, a concentration gradient exists. For homogeneous suspension, head loss equations were developed and experimentally verified. Contains 23 references.

R203013X67A

Graf, Walter and Acaroglu, Ertan R

INVESTIGATION OF TWO-PHASE (LIQUID-SOLID) PROBLEMS

Water Resources Center Tech Rep 2, Cornell Univ, Nov 1967. 24 p, 7 fig, 3 tab, 23 ref

Cornell University, Ithaca, N Y

DESCRIPTORS-/ hydraulics/ suspended sediments/ *slurries/ grain shapes/ grain sizes/ *sediment transport/ *settling velocity/ suspended load/ *sedimentation/ particle shapes/ particle size/ sediment load/ closed conduit flow/ *head losses/ hydraulic conduits/ pipelines/ *hydraulic transportation/ bibliographies
IDENTIFIERS-/ *two-phase flow

R203014 67A PROPERTIES OF STREAM CHANNEL SEDIMENTS
In the arid and semiarid regions of the southwestern United States, a large portion of the natural water recharge is through channel beds and alluvial deposits in river basins. Water transmission in these beds varies with time, location, depth and extent of alluvium, and hydraulic characteristics of flows, sediment loads, and morphology of the channels. An alluvial profile in an ephemeral stream channel was found to have layers with relatively high clay and silt accumulation. Samples from a pit in the channel were subjected to a micromorphological examination using thin sections. Clay and silt were found to have accumulated on sand and gravel particles and around aggregates. In the laboratory, samples of alluvium material were dispersed. The clay and silt fractions were collected, dried, and then mixed again with the washed material. The hydraulic conductivity of the mixed material was 30% less than that for the nondispersed sample. These results are attributed to the orderly arrangement of clay and silt on the surfaces and between the larger sand and gravel particles of the nondispersed samples.

R203014 67A

Qashu, H K and Buol, S W

HYDRAULIC AND MICROMORPHOLOGICAL PROPERTIES OF STREAM CHANNEL SEDIMENTS

Fed Water Pollut Contr Admin Rep, Second Quarter 1967. 5 p, 4 fig, 1 tab, 4 ref

University of Arizona, Tucson; North Carolina State University, Raleigh

DESCRIPTORS-/ infiltration/ permeability/ *sediments/ porous materials/ runoff/ ephemeral streams/ *streambeds/ streamflow/ morphology/ silts/ *alluvial deposits/ sediment transport/ clays/ streams/ hydrology/ hydraulic conductivity/ alluvial streams/ porous media/ Southwest U.S./ Arizona
IDENTIFIERS-

R203027 67A STREAM FLOW RATE EXTREMES

Stream discharge data for the State of Arkansas are analyzed for representative statistical parameters. The statistical distribution most applicable to stream discharge data in Arkansas is the Pearson Type III skew frequency curve. The parameters of the Pearson Type III curve for all available records in Arkansas are included as Appendix A. The paramaters of the logarithmically normal frequency distribution are included as Appendix B for mean daily discharge, minimum daily discharge, and instantaneous minimum daily discharge. The logarithmically normal frequency distribution may be used for the lower discharge rates in lieu of the Pearson Type III distribution except where instances of zero discharge are likely. The following determinations are applicable to the State of Arkansas. There is no correlation between the coefficient of variation and area for minimum daily discharge. There is no correlation between skewness and area. The mean daily discharge rate is 1 cu ft/ sec/sq mi. Suggested applications of the parameters in Appendix A are set forth for flood control, pollution control, and water supply.

R203027 67A

Jeffus, Hugh M

QUANTITATIVE ANALYSIS OF STREAM FLOW RATE EXTREMES

Water Resources Res Center Publication 1, Univ of Arkansas, 1967. 310 p, 27 fig, 3 append

University of Arkansas, Fayetteville and US Army Corps of Engineers, Vicksburg, Mississippi

DESCRIPTORS-/ *hydrology/ *streamflow/ runoff/ pollution abatement/ river regulation/ *streamflow records/ statistics/ flood control/ water supplies/ hydrologic data/ discharge measurement/ drainage basins/ *flow rates/ flood peaks/ flood forecasting/ Arkansas/ flow characteristics

IDENTIFIERS--/ Pearson Type III distrib/ flood frequency

R203031 67A STORMFLOW SOURCES IN SMALL WATERSHEDS

The report describes a detailed experimental-numerical investigation designed to isolate the time-spatial distribution of local runoff entering the main channel of a small watershed. The integration of a routing technique and extensive land-phase instrumentation allowed the channel inflows to be identified as flow from seeps, channel precipitation, and ground water. Analysis of a series of storms showed that only a small portion of the watershed contributed flow to the storm hydrograph. The contributing area was found to be a function of the storm duration and intensity and occurred in the form of localized zones of intense contribution. In a given storm the contributing area was found to fluctuate with changes in the rainfall intensity. During periods of low intensity, most of the flow came from channel precipitation and rain falling on the wet areas surrounding a series of seeps. In a period of high intensity flow through the forest litter on the hillsides and a rapid response in the ground water created a larger contributing area. Has 24 references.

R203031 67A

Ragan, Robert M

ROLE OF BASIN PHYSIOGRAPHY ON THE RUNOFF FROM SMALL WATERSHEDS

Water Resources Res Rep 17, Univ Vermont, 1967. 43 p, 18 fig, 24 ref

University of Vermont, Burlington

DESCRIPTORS--/ *runoff/ seepage/ hydrographs/ *geomorphology/ streamflow/ *surface runoff/ *watersheds/ ground water/ rainfall/ storms/ routing/ soil moisture/ discharges/ hydrology/ *drainage basins/ seismographs/ *small watersheds/ watershed management/ rainfall-runoff relationships/ floods/ inflow/ bibliographies

IDENTIFIERS-- / forest seeps

R203034 68A WATER PROJECTS AND WATERSHED TREATMENT
A presumptive approach was used to analyze the effect of land-management-caused alteration of hydrology on output of water conservation projects. Two basic hydrologic reactions to land treatment were assumed: (1) a constant factor flow increase for all months of the year, and (2) a 1/2-month delay in the annual hydrograph. These alterations were applied singly and in combination to a series of computer-generated reservoir inflows; storage-yield relationships were determined by the sequent peak method for altered (treated) and unaltered (virgin) inflows. The differences between yields at various storages were determined by subtraction and attributed to the differences in inflows or alterations. Results indicated that not all flow increases were of value to the project in terms of increased yield. A constant factor increase gained utility with increasing storage. A timing delay had little effect on yield at extremely small and extremely large storages, but had maximum effect at intermediate storages. A combination of flow increases and timing delays affected the yield curve in an approximately additive fashion, combining the 2 separate treatments nearly linearly. Has 75 references.

R203034 68A

Hawkins, Richard Holmes

WATER PROJECTS AND WATERSHED TREATMENT

Pap, Colo State Univ, June 1968. 112 p, 20 fig, 12 tab, 75 ref, append

Colorado State University, Fort Collins

DESCRIPTORS--/ *watersheds/ water yield/ *drainage basins/ runoff/ hydrology/ bibliographies/ reservoirs/ *reservoir yield/ streamflow/ computer programming/ *land management/ water resources/ vegetation

IDENTIFIERS--/ inflow/ *watershed management/ *forest management/ clear-cutting/ forests/ mathematical models/ hydrologic models

R203061 68A RUNOFF IN UNGAGED SEMIARID AREAS
Methods for estimating mean annual runoff in semiarid regions are described for preliminary or reconnaissance evaluations. Limited streamflow data are used to establish runoff-altitude relations by homogeneous regions. Precipitation-altitude relationships can be used to support development of regional runoff-altitude relations where streamflow data are limited. Runoff estimates can be made for ungaged basins within the region from regional values. In generally homogeneous regions, effects of topography, geology, precipitation, and vegetation may result in local variations of regional runoff-altitude relations. Adjustments can be made by measuring runoff during the field study. Miscellaneous measurements of perennial streams in the basin can be used to adjust regional values. Channel geometry measurements can be used to adjust regional values for perennial and ephemeral streams. After runoff-altitude relations are defined, the method of estimating runoff is easy to apply. The method can be applied to a small area having all or part of a drainage basin or to a valley or mountain block having many drainage basins. Application to larger areas will result in more reliable values because areas of inordinately high and low runoff would compensate.

R203061 68A

Moore, Donald O

ESTIMATING MEAN RUNOFF IN UNGAGED SEMIARID AREAS

Bull Int Ass Sci Hydrol, pp 29-39, Feb 1968. 11 p, 7 fig, 4 tab, 2 ref

Geological Survey, Carson City, Nev

DESCRIPTORS--/ *runoff forecasting/ *runoff/ *surface runoff/ *semiarid land/ watersheds/ drainage basins/ hydrometeorological station/ stream gages/ water measurement/ streamflow/ streamflow records/ geomorphology/ discharge measurement/ rainfall/ atmospheric precipitation/ estimating

IDENTIFIERS--/ altitude/ gaging stations/ *runoff-altitude relations/ Nevada

R203070 68A TRACER MEASUREMENT OF STREAMFLOW
This investigation covers several methods of streamflow gaging in streams of 10-250 cusecs using radioactive isotopes and involving withdrawal of samples from streams for in situ measurement. The total counts method was favored because of its ability to sample large volumes, giving reliable results at short sampling distances. For flows of 5000 cusecs and above, the total counts method offers the highest detection sensitivity but requires excessively large tracer amounts with increased health hazards and additional expense. Thus, the total counts method applies to flows up to 5000 cusecs. The method is extended to conditions of noninfinite geometry using a probe in the stream. The extended method allows in situ gaging in streams as shallow as 2 ft. An empirical method for predicting tracer passage times from tracer arrival times is based on a series of measurements of tracer passage in rivers at low flow. The merits of colloidal Gold 198 and Chromium 51 EDTA as tracers for riverflow gaging are discussed. Colloidal gold was insignificantly adsorbed over a measuring reach of 3000 ft.

R203070 68A

Ward, P R B and Wurzel, P

THE MEASUREMENT OF RIVERFLOW WITH RADIOACTIVE ISOTOPES WITH PARTICULAR REFERENCE TO THE METHOD AND TIME OF SAMPLING

Bull Int Ass Sci Hydrol, pp 40-48, Feb 1968. 9 p, 2 fig, 1 plate, 2 tab, 7 ref

Agricultural Research Council of Central Africa

DESCRIPTORS--/ *streamflow/ *discharge measurement/ *water measurement/ *radioactive isotopes/ *tracers/ hydrology/ isotopes/ sampling/ rivers/ time/ measuring instruments/ field tests/ streams/ reaches (distance)/ mixing/ counting method

IDENTIFIERS--/ gold isotopes/ chromium isotopes/ total count method/ Africa/ foreign research/ shallow flow/ travel time

R203089X68A DYE TRACERS COLLECT HYDROLOGIC DATA
Dye tracers were used in Oregon in collecting hydrologic data on 2350 mi of stream channels in the Long Tom, Umpqua, Willamette, and John Day River basins, and in the Carmen-Smith power tunnel. These investigations demonstrated the usefulness of dye tracers for determining: (1) estimates of traveltimes and travel rates of water, (2) discharge where standard measuring methods are not applicable, and (3) dispersion characteristics of streams. The results of time-of-travel studies are presented in simple, concise, and readily interpreted form.

R203089X68A

Harris, D D and Sanderson, R B

USE OF DYE TRACERS TO COLLECT HYDROLOGIC DATA IN OREGON

Water Resour Bull, Vol 4, No 2, pp 51-68, June 1968. 18 p, 11 fig, 3 tab, 9 ref

Geological Survey, Portland, Oreg

DESCRIPTORS--/ *dyes/ *tracers/ *hydrologic data/ *streamflow/ rivers/ velocity/ time/ discharge measurement/ water measurement/ hydrology/ flow/ dispersion/ streams/ fluorescence/ hydrographs/ tunnels

IDENTIFIERS--/ travel time/ Oregon/ fluorometers/ *rhodamine B

R203090X68A RESEARCH METHODS IN LAND-USE HYDROLOGY
Land use changes affecting the hydrological cycle encompass a broad field of agricultural, forestry, and engineering activities. A variety of research methods, ranging from very simple to very complex, have been used to evaluate effects of such changes. Distinguishing the effects of changes in land use from natural variations in quality, quantity, peak rates, and other runoff characteristics is difficult because of the complexity of the hydrological process. Methods of collecting data include use of plots, experimental catchments, barometer watersheds, representative basins, benchmark and vigil networks. Data analysis methods range from simple graphical correlations to multivariate analysis and mathematical catchment models. Current research methods are mainly of an ad hoc nature and the major deficiency is in the study of fundamental physical processes. Has 32 references.

R203090X68A

Boughton, Walter C

RESEARCH METHODS IN LAND-USE HYDROLOGY

Water Resour Bull, Vol 4, No 2, pp 34-44, June 1968. 11 p, 32 ref

Lincoln College, Canterbury, New Zealand

DESCRIPTORS--/ hydrology/ research and development/ *land utilization/ *watersheds/ *drainage basins/ *runoff/ *surface runoff/ geomorphology/ statistical analysis/ bibliographies/ water yield/ soil erosion/ land forms/ calibrations/ *methodology/ land preparation/ land resources/ data collection systems/ streamflow
IDENTIFIERS--/ catchments/ hydrologic models/ *demonstration watersheds/ watershed management/ evaluation

R203117 67A RESERVOIR TEMPERATURE AND EVAPORATION
The application of a monolayer to a reservoir water surface to reduce evaporation causes a relative rise in the water temperature over the temperature that would occur without film application. Data were collected from the 600-acre Pactola Reservoir where a monolayer coverage of 73% was maintained over a 98-day period to evaluate specifically this increase in water temperature. Water temperatures increased at the surface and also at greater depths. This increase in temperature has to be accounted for in predicting the reduction in evaporation by monolayers. Values used for the increased temperature predicted from the combined energy-budget-mass-transfer method indicated a decrease of 8 to 14% in values for evaporation reduction as estimated by the simplified Bureau of Reclamation method, which did not account for the rise in temperature. An approach to predicting the increase in reservoir temperature and the reduction in evaporation as applied to 1 reservoir gave values for the temperature increase close to those measured.

R203117 67A

Bartholic, Jon F; Runkles, Jack R; Stenmark, Ernest B

EFFECTS OF A MONOLAYER ON RESERVOIR TEMPERATURE AND EVAPORATION

Water Resour Res, Vol 3, No 1, pp 173-179, 1967. 7 p, 3 fig, 1 tab, 12 ref

U S Army Electronics Command, Fort Huachuca, Ariz and Texas A&M, College Station
DESCRIPTORS--/ evaporation/ *reservoir evaporation/ *monomolecular films/ water management/ evaporation control/ *water temperature

IDENTIFIERS--/ Pactola Reservoir, S Dak/ Pactola Dam, S Dak

R203131X67A DEPOSITION BEHIND LOW DAMS AND BARRIERS

Many upland areas in the western U.S. are being eroded rapidly by overland flow and little opportunity for redeposition of the sediment is afforded by the drainage channels. Attempts have been made to stop further erosion and refill existing gullies by construction of low dams and barriers. Sheep Creek (Utah), Polacca Wash and Zion Dam (Ariz) and Mexican Springs, Tinian and Cornfield Wash (New Mexico) are sites of such efforts. Observations reported here described particle size, distribution of material deposited, volume, extent and slope of deposit and original channel gradient. Particle size to some extent influenced the rate of filling of steep sided gullies. Filling of the channel upstream depends on amount of coarse material moved as bedload. Up to 10% of material in some cases was deposited above spillway level. Low permeable barriers have steeper surface gradients than originally, while low dams have surface gradients less steep than the original.

R203131X67A

Lusby, G C and Hadley, R F

DEPOSITION BEHIND LOW DAMS AND BARRIERS IN THE SOUTH-WESTERN UNITED STATES

J Hydrol (New Zealand), Vol 6, No 2, pp 89-105, 1967. 17 p, 9 fig, 3 tab

Geological Survey, Denver, Colo

DESCRIPTORS--/ *check structures/ *erosion/ sediment transport/ particle size/ sediment control/ reservoir silting/ dams/ silting/ *deposition (sediments)/ gully erosion/ arid lands/ Arizona/ New Mexico/ Southwest U.S./ Great Basin/ Utah/ alluvial channels

IDENTIFIERS--

R203134 67A RUNOFF AND HILLSLOPE EROSION

Measurements of hydrologic and geomorphic processes were possible on a single high intensity convective thunderstorm in Badger Wash Basin, western Colorado on Aug 12, 1964. The 12-acre basin, fenced to exclude livestock, has a reservoir at the lower end that retains all runoff and sediment. The maximum intensity of rainfall for a 10 minute period was 1.98 inches per hour. The total runoff measured in a reservoir was 0.508 inches over the basin and the total precipitation was 0.90 inches when run-off stopped. Erosion pins along 6 hillslope profiles indicated that approximately 0.11 acre-foot was eroded and 0.090 acre-foot was delivered to the lower end of the basin. Where diverse topography was not a complication, erosion pins were considered to be an accurate measure of soil loss.

R203134 67A

Hadley, Richard F and Lusby, Gregg C

RUNOFF AND HILLSLOPE EROSION RESULTING FROM A HIGH-INTENSITY THUNDERSTORM NEAR MACK, WESTERN COLORADO

Water Resour Res, Vol 3, No 1, pp 139-143, 1967. 5 p, 3 fig, 8 ref

Geological Survey, Denver, Colo

DESCRIPTORS-- /rainfall intensity/ storms/ *erosion/ infiltration/ runoff/ convection/ thunderstorms/ cloudbursts/ soil erosion/ slopes Colorado/ *sediment yield/ *storm runoff/ marking techniques/ rainfall-runoff relationships

IDENTIFIERS--

R203140 68A RUNOFF FARMING: I. EXPERIMENTAL LAYOUT
An experiment was established to grow fruit trees, field crops, and pasture plants in a 100 mm winter rainfall desert region of Israel by harvesting surface runoff from small desert watersheds. Two ancient farm systems were restored to study the hydrology of the desert catchments and the water harvesting techniques of the ancient farmers. Restoration included rebuilding runoff-collecting hillside conduits, farm terraces, fences, and the distribution systems. Rations of catchment to cultivated area were 16 to 1 and 25 to 1 respectively. Water stage recorders and weirs were installed to measure the runoff passing onto the farms and rain gages were placed in the farm catchment area. A meteorological station was set up on one of the farms. The loessial farm soils were sandy and silty loams of aeolian or partly redistributed fluviatile origin, 2.5 to 3 meters deep. During 5 years of research agricultural crops have been subjected to extreme drought conditions and heavy floods. Has 21 references.

R203140 68A

Evenari, M; Shanan, L; Tadmor, N H

"RUNOFF FARMING" IN THE DESERT. I. EXPERIMENTAL LAYOUT

Agron J, Vol 60, No 1, pp 29-32, 1968. 4 p, 7 fig, 21 ref

Hebrew University, Jerusalem, Israel

DESCRIPTORS--/ *water spreading/ irrigation systems/ flood routing/ deserts/ arid climates/ weirs/ water harvesting/ *fruit crops/ field crops/ pastures/ watersheds (basins)/ hydrology/ runoff/ irrigation practices

IDENTIFIERS--/ Negev, Israel/ runoff farming/ water recovery

R203153 68A STATISTICAL PROPERTIES OF DUNE PROFILES
Properties of sand waves formed by subcritical, undirectional water currents are investigated by statistical analyses of streambed profile records. Results show that although bed elevation deviates from the postulated normal distribution of sand particles, estimates of many properties of the bed profiles can be derived from simple statistical models. Records of bed elevation y as a function of distance x along the channel, $y=y(x)$, and time at a fixed place, $y=y(t)$, are from 3 lab flumes 8 in., 2 ft, and 8 ft wide and a straight alluvial channel 55 ft wide. Bed material is fine sand in all cases. Analyses show that both types of records, $y(x)$ and $y(t)$, can be represented as stationary Gaussian processes. Statistical properties of all flume data are similar, and no distinguishing characteristics can be attributed to flume size or to whether bed forms are ripples or dunes. Field data, however, reflect influence of large alternate bars not present in the flumes. The problem of predicting properties of interest of bed profiles is not solved, but results of this study suggest several approaches using both refined theoretical models and additional experimental data. Has 33 references.

R203153 68A

Nordin, Carl F, Jr

STATISTICAL PROPERTIES OF DUNE PROFILES

Geol Surv Open-File Rep, May 1968. 137 p, 44 fig, 7 tab, 33 ref, 3 append

Geological Survey, Fort Collins, Colo

DESCRIPTORS--/ sediments/ *statistical methods/ dunes/ bibliographies/ *sediment transport/ streamflow/ streambeds/ flumes/ particle size/ ripple marks/ channel morphology/ shape/ spectroscopy/ *model studies/ width/ slopes/ spectrum analysis

IDENTIFIERS-- / *bed profiles/ sediment bars/ *spectral analysis/

R203155 68A LOW-FLOW ANALYSIS, BETHLEHEM, NEW YORK
The magnitude and frequency of low flows at 8 sites in and near the southern part of the town of Bethlehem, Albany County, New York, are evaluated. The area is one of continued residential and industrial development and includes about 45 sq mi in Coeymans Creek basin and 30 sq mi in Vloman Kill basin. The analysis is based on a series of base-flow measurements made during the summer and fall of 1966 and the summer of 1967. The low-flow frequency characteristics were determined by correlating the measurements with contemporaneous flows at 2 or more nearby complete-record stations where frequency characteristics have been defined. The correlations produced estimates of the annual minimum 7-day flow to be expected 1 yr out of 2 and 1 yr out of 10. Low-flows are affected to some extent by upstream impoundment and diversions or by discharge into the streams of sewage effluent and backwash water from the Albany filtration plant. Discharge measurements made since 1952 at 18 sites in the 2 basins are tabulated.

R203155 68A

Hunt, Oliver P and Beall, Robert M

A PRELIMINARY ANALYSIS OF LOW FLOWS AT SELECTED SITES IN THE SOUTHERN PART OF THE TOWN OF BETHLEHEM, NEW YORK

N Y Water Resour Comm Rep of Invest RI-1, 1968. 10 p, 2 fig, 3 ref, append

Geological Survey, Bethlehem, N Y

DESCRIPTORS--/ *streamflow/ *base flow/ frequency analysis/ flow rates/ *flow characteristics/ surface waters/ discharge (water)/ *low flow/ streams/ discharge measurement/ New York/ hydrologic data/ stream gages/ alteration of flow

IDENTIFIERS--/ *low-flow frequency/ frequency characteristics/ Hudson River basin/ Bethlehem, N Y/ correlation/ Hudson River

R203156 68A AN INVESTIGATION OF FLOODS IN HAWAII
Annual peak stages and discharges for the period of record to June 30, 1967, are tabulated for 167 stations in Hawaii. The data are arranged on a fiscal-yr basis. Peak discharge measurements from 1961-67 at 56 miscellaneous-measurement sites are given. Tabulation includes data for 125 stations in operation during 1967 fiscal yr. For 1967, flooding was greatest during November and May. Major flood events during the yr were the following: July 25 in the Hilo area of Hawaii, October 10-12 and November 4-6 on Oahu, January 11 on Hawaii, March 24 on Maui, and May 20-21 on Kauai.

R203156 68A

Hoffard, S H and Fowler, K H

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH JUNE 30, 1967.

Geol Surv Water Resour Div, Hawaii, Basic Data Release Progr Rep 10, May 1968. 167 p, 5 fig, 1 tab

Hawaii State Department, Honolulu

DESCRIPTORS--/ *floods/ flood damage/ flow measurement/ gaging stations/ streamflow/ *discharge (water)/ *peak discharge/ flash floods/ channel flow/ *discharge measurement/ Hawaii/ surface waters/ *stage-discharge relations/ river flow/ hydrologic data/ runoff/ flood peaks

IDENTIFIERS--/ *flood stages/ annual peak stage/ peak runoff/ annual floods/ crest-stage gage/ flow measurement

R203157 68A HYDROGEOLOGY, POTOWOMUT-WICKFORD AREA, RHODE ISLAND
Mathematical-model evaluation of the sand and gravel aquifers indicates that during exceptionally dry years they can sustain pumping rates 8 mgd (2 times present rate) in Potowomut River basin, 3.6 mgd (3 times present rate) in Annaquatucket River basin, and 1.3 mgd (13 times present rate) in Pettaquamscutt River basin. An unused aquifer in the Potowomut basin could supply 5 mgd for 100 days with careful management. Sustained pumping at these rates would dry the Hunt and Potowomut Rivers for as much as 160 days and might result in saline-water intrusion in the Pettaquamscutt basin. Hydrologic budgets show annual recharge was 15 in., and groundwater evapotranspiration loss, 3 1/2 in. in Potowomut basin; recharge was 18 in., and ground-water evapotranspiration, about 2 in. in Annaquatucket basin. About 1/2 the runoff in the 2 basins is groundwater discharge. Groundwater is of good quality locally except for excessive iron or manganese. Dissolved-solids content is less than 70 ppm. Variations in coefficient of transmissivity, ranging from 10,000 to 300,000 gpd/ft, are shown on a 1:24,000 scale map. Maps also show saturated thickness, extent of aquifers, and water-table contours. Graphs show components of drawdown in a pumped well and method of computing drawdown. Has 42 references.

R203157 68A

Rosenshein, J S; Gonthier, Joseph B; Allen, William B

HYDROLOGIC CHARACTERISTICS AND SUSTAINED YIELD OF PRINCIPAL GROUND-WATER UNITS, POTOWOMUT-WICKFORD AREA, RHODE ISLAND

Geol Surv Water-Supply Pap 1775, 1968. 38 p, 8 fig, 5 plate, 10 tab, 42 ref

Geological Survey and Rhode Island Water Resources Coordinating Board, Kingston

DESCRIPTORS--/ *hydrograph analysis/ transmissivity/ hydrologic budget/ groundwater recharge/ *aquifers/ *hydrologic properties/ bibliographies/ Rhode Island/ *mathematical models/ permeability/ *groundwater barriers/ streamflow/ discharge (water)/ chemical analysis/ withdrawal/ base flow/ *groundwater/ water quality/ pumping/ infiltration/ evapotranspiration
IDENTIFIERS--/ induced infiltration/ *image-well analysis/ *groundwater potential/ aquifer model/ aquifer characteristics/ *sustained yield

R203209X67A SPRAYED ASPHALT PAVEMENTS FOR WATER HARVESTING
Sprayed asphalt pavement as a low-cost method of water harvesting, was investigated under varying conditions in Ariz. Soils ranging from clay loams to porous cinders were utilized and sprayed with asphalts of varying composition. Specifications of both are given. Pavements first soaked with an asphalt compound to form a strong but porous surface and recoated with a second sealing asphalt compound were in excellent condition 1.5 to 3 years later. They provided essentially 100% runoff of precipitation. The penetration of asphalt into soil and the bonding of soil particles is a function of the chemical compositions of asphalt and of soil, soil structure and soil moisture content. Penetration and bonding cannot be predicted but can be determined by properly conducted laboratory tests. 1100 sq yd pavements have been constructed for approximately 73¢ per sq yd with maintenance costs of 10 to 17¢ per sq yd. Asphalt oxidation products which color runoff water prevent domestic use of this water currently. A satisfactory method for their removal will be necessary before this can be recommended.

R203209X67A

Myers, Lloyd E; Frasier, Gary W; Griggs, John R

SPRAYED ASPHALT PAVEMENTS FOR WATER HARVESTING

Amer Soc Civ Eng, J Irrig Drainage Div, Vol 93, No IR3, pp 79-91, Sept 1967. 19 p, 1 fig, 9 tab, 13 ref

United States Water Conservation Laboratory, Phoenix, Ariz

DESCRIPTORS--/ deserts/ asphaltic concrete/ *asphalt/ membranes/ soil stabilization/ bituminous materials/ spraying/ pavements/ *impervious membranes/ surface runoff/ *water harvesting/ bonding/ *soil sealants/ rainfall-runoff relationships/ watersheds (basins)/ paving/ *water yield improvement
IDENTIFIERS--/ *asphalt membranes

R203211 68A THE MEANDERING OF NATURAL STREAMS IN ALLUVIAL MATERIAL
Although there have been numerous publications which might be classified under the general subject of meanders, they have, for the most part, been preoccupied with the origin of meanders, helicoidal flow or the search for a characteristic or standard meander. There seems to be little published information on the analysis of actual velocity patterns, the nature and role of bank caving or anomalies and differences in the geometry of bends. The purpose of this paper is to present a qualitative summary of current knowledge on the meandering of streams in alluvial materials, based upon a review of pertinent literature, data supplied by the Vicksburg and Little Rock Districts, Corps of Engineers, United States Army, and the observation of small-scale meanders on a tilting sand table. It is intended that this paper provide some coverage of the aspects of meandering that have hitherto been neglected.

R203211 68A

Shindala, Adnan and Priest, Melville S

THE MEANDERING OF NATURAL STREAMS IN ALLUVIAL MATERIALS

Water Resour Res Inst Rep, Miss State Univ, June 1968. 21 p, 6 fig, 12 ref

Mississippi State University, State College

DESCRIPTORS--/ *rivers/ erosion/ deposition/ stream erosion/ stream meandering/ river training/ river currents/ *meanders/ sediment distribution/ flow characteristics/ bank stability

IDENTIFIERS--/ river bends/ helicoidal flow

R203213 68A DROUGHT FREQUENCY, INTENSITY, AND DURATION
Meteorological and hydrological data in Raritan River basin, New Jersey, is correlated. Distribution of Palmer Drought Index (PDI) provides basis for designating a characteristic monthly streamflow below which streamflow deficits are measured. Synthetic generation of PDI values is demonstrated and methodology of determination of severity, duration, and frequency of meteorological and hydrological droughts from synthetic data is shown.

R203213 68A

Havens, A V; Snow, W B; Liu, C S; et al

DROUGHT FREQUENCY, INTENSITY, AND DURATION: ITS CORRELATION TO STREAMFLOW AND ITS IMPACT UPON SYNTHETIC HYDROLOGY

Water Resour Res Inst Tech Rep, Rutgers Univ, 1968. 49 p, 10 fig, 7 tab, 9 ref

Rutgers--The State University, New Brunswick, N J

DESCRIPTORS--/ *droughts/ frequency/ *streamflow forecasting/ water yield/ *stochastic processes/ *synthetic hydrology/ duration/ time series analysis/ rainfall-runoff relationships

IDENTIFIERS--/ drought index/ Raritan River Basin, N J

R203214 68A RUNOFF COEFFICIENTS FOR SMALL AREAS
The design flood peak for small drainage structures is usually estimated as the product of a runoff coefficient, a rainfall intensity, and a drainage area. The primary problem encountered in applying the method is selecting an appropriate runoff coefficient. Actually, the coefficient is the product of two components. The first relates peak overland flow rate to peak rainfall intensity. The second relates peak streamflow to peak overland flow. The Stanford Watershed Model was used to develop a set of curves to estimate the peak rate of overland flow from average watershed values of soil depth, soil permeability, overland slope, impervious area, and soil surface exposure. Fifty-yr runoff coefficients for Lexington, Kentucky for 39 natural watersheds varied from 0.354 to 0.610. A second curve was developed for adjusting the coefficient for climatic differences. Multipliers ranged from 1.28 for the North Carolina mountains to 0.71 for Central California. A third curve for adjusting the coefficient for frequency showed multipliers ranging from 0.61 for the mean annual flood to 1.12 for the 1000-year flood. The overland flow runoff coefficient may be estimated as the product of the basic value and the two appropriate adjustment multipliers. Contains 36 references.

R203214 68A

Miller, Carlos Fix

EVALUATION OF RUNOFF COEFFICIENTS FROM SMALL NATURAL DRAINAGE AREAS

Res Rep 14, Univ Ky, 1968. 112 p, 25 fig, 14 tab, 36 ref

University of Kentucky, Lexington

DESCRIPTORS--/ *surface runoff/ infiltration/ slopes/ flood routing/ frequency curves/ drainage/ flow duration curves/ culverts/ vegetation effects/ *rational formula/ runoff coefficient/ peak discharge/ time of concentration/ *overland flow/ *rainfall runoff relationships/ frequency analysis/ soil surfaces/ precipitation excess/ bibliographies
IDENTIFIERS--/ Stanford Watershed Model/ vegetal cover

R203216 68A HYDROGRAPH CHANGES & WATERSHED CONDITIONS
Selection of the economic optimum combination of flood control measures by stage throughout project life and by location within the flood plain requires evaluation of the effects of urban development and channel improvement on the peak, volume, rising time, and shape of the flood hydrograph. Through application of the Stanford Watershed Model to a given watershed before and after an extensive period of urban development and channel improvement, a series of curves were developed for determining each of the effects on flood hydrographs. The end product is a computer program capable of generating flood hydrographs appropriate for any typical watershed surface, drainage area, urban development, and degree of channel improvement. Values are developed and compared between California and Kentucky to obtain some idea as to the effects of geographical and climatic setting on the results. The method of hydrograph generation is applied to an economic analysis of the optimum combination of structural and non-structural flood control measures within South Jefferson County, Kentucky, Has 32 references.

R203216 68A

Dempsey, Clyde R.

THE EFFECTS OF GEOGRAPHICAL AND CLIMATIC SETTING ON THE ECONOMIC ADVANTAGES OF ALTERNATIVE FLOOD CONTROL MEASURES

Res Rep 10, Univ Ky, 1968. 166 p, 26 fig, 45 tab, 32 ref, 5 append

University of Kentucky, Lexington

DESCRIPTORS--/ *hydrographs/ streamflow forecasting/ flood plains/ land use/ project planning/ digital computers/ floodproofing/ *urbanization/ flood plain zoning/ channel improvement/ *non-structural alternatives/ economic justification/ climatic zones/ time lag/ bibliographies

IDENTIFIERS--/ *urban hydrology/ Sacramento, Calif/ Stanford Watershed Model/ Sacramento Valley, Calif/ economic evalution/ Louisville, Ky

R203223 68A THE EFFECTS OF VARYING LAND AND WATER USE
The effects on streamflow regimen of converting an irrigated area to dry land, with concurrent transportation of the water to a municipality located several miles from the original point of use, were studied. A water budget of the city of Laramie, Wyoming was made on a daily basis from May 1, 1965 to September 30, 1967. All inflows to the system were monitored and the outflow to the river observed. The effect of the municipality's water supply system on the streamflow regimen was determined. Both an inflow-outflow study and Blaney-Criddle analysis were made on the use by agriculture. Return flows approximating 20% of diversion should have been evidenced. A comparison of type of use on the streamflow is presented for both the same annual volume of diversion and the same maximum rate of diversion. Has 44 references.

R203223 68A

Rechard, Paul A and Lane, John E

THE EFFECTS OF VARYING LAND AND WATER USE ON STREAMFLOW REGIMEN

Water Resour Ser 10, Univ Wyoming, June 1968. 64 p, 7 fig, 16 tab, 44 ref

University of Wyoming, Laramie

DESCRIPTORS--/ irrigation/ municipal water/ *return flow/ *streamflow/ *water rights/ water utilization/ water measurement/ consumptive use/ hydrologic budget/ hydrologic equation/ *land use/ municipal wastes/ water consumption/ water resources development/ *prior appropriation/ treatment facilities/ Wyoming/ bibliographies
IDENTIFIERS--/ Laramie, Wyo

R203226 68A TANK FOR DEMONSTRATING ALLUVIAL PROCESSES
A narrow, portable sedimentation tank was constructed to demonstrate fluvial processes in a physical geology classroom. The tank consists of 2 pieces of 9 x 48 in. glass mounted 1-3/4 in. apart in an angle-iron frame. The tank had adjustable legs to vary the slope of the bottom and a movable drain to vary the depth of water. A V-shaped feeding tray placed on top of the tank was used to introduce water and sediment into the tank. The glass sides allowed the formation to be viewed in cross-section. This apparatus successfully demonstrated the formation of alluvial fans and deltas with topset and foreset beds. It also was useful in demonstrating headward erosion and movement of turbidity currents down a steep underwater slope.

R203226 68A

Larsen, Frederick D

A TANK FOR DEMONSTRATING ALLUVIAL PROCESSES

J Geol Educ, Vol 16, No 2, pp 53-55, Apr 1968. 3 p, 5 fig, 2 ref

Norwich University, Norfield, Vermont

DESCRIPTORS--/ *geomorphology/ *hydraulic models/ deltas/ sedimentation/ stream erosion/ laboratories/ technology/ *deposition (sediments)/ model studies/ alluvial deposits/ alluvium/ *hydrogeology/ turbidity currents

IDENTIFIERS--/ *headward erosion/ *portable sedimentation tanks

R203232 68A RELATION OF CHANNEL WIDTH TO STREAMBED PERMEABILITY

An analysis of geohydrologic conditions along Big Sandy Creek, east-central Colorado, indicates that the widest part of the 178-mi long channel corresponds with the beginning of stream losses and a decrease in channel width, both of which are related to the streambed permeability. The channel widens downstream in the upper 38 mi with mostly perennial streamflow, and narrows downstream in the lower 140-mi reach where flow is mostly ephemeral. The water table is from 2 to 5 ft below channel bed in the lower reach and the valley alluvium can absorb and transmit the entire flow of the usual short-duration floods. The decrease in channel width is the result of adjustment to long-term downstream decrease in flood discharge. Rate of decrease in width between any 2 sites along the channel affords a basis for estimating average vertical permeability of the streambed between those sites. The estimated values of permeability may be used for computation of water losses from the stream to the valley alluvium.

R203232 68A

Coffin, Donald L

RELATION OF CHANNEL WIDTH TO VERTICAL PERMEABILITY OF STREAMBED, BIG SANDY CREEK, COLORADO

Geol Surv Prof Pap 600-B, pp B215-B218, 1968. 4 p, 2 fig, 1 ref

Geological Survey, Helena, Mont

DESCRIPTORS--/ *streambeds/ permeability/ streamflow/ ephemeral streams/ water table/ channels/ seepage/ *channel morphology/ *influent streams/ regimen/ alluvium/ floods/ perennial streams/ porous media/ underflow/ transmissivity/ discharge (water)/ Colorado/ geologic control/ channel flow/ precipitation (atmospheric)/ *surface-groundwater relationships
IDENTIFIERS--/ vertical permeability

R203237X68A DOUBLE-MASS ANALYSIS ON THE COMPUTER

A method of double-mass analysis on the computer is described. The flow diagram is illustrated, and samples of output are given. The double-mass analysis is used by hydrologists to verify the consistency of precipitation or streamflow records by plotting data from one station against the combined data for surrounding stations. The consistency is verified if a single straight line through the points is reasonable. Computer analysis involves fitting a straight line and a fourth-degree polynomial through the points and comparing the 2 sums of squares of deviations of the points from the fitted curves. If inconsistent, the break point in the record can be determined by the computer which also will compute equations for the straight lines through the points on each side of the break point. The computer method is suggested to save time and minimize data handling, and should be of value to hydrologists who have such facilities available.

R203237X68A

Singh, Rameshwar

DOUBLE-MASS ANALYSIS ON THE COMPUTER

Proc Amer Soc Civ Eng, J Hydraul Div, Vol 94, No HY1, pp 139-142, Jan 1968. 1968. 4 p, 2 fig, 1 tab, 2 ref

San Jose State College, Calif

DESCRIPTORS--/ methodology/ hydraulics/ hydrologic data/ *streamflow/ graphical analysis/ hydrology/ *mass curves/ computer programs/ least squares method/ mathematical studies/ *analytical techniques/ stations/ evaluation/ data collections/ *precipitation (atmospheric)/ statistical methods
IDENTIFIERS--/ *double-mass curves

R203241X68A SEDIMENTATION IN RETARDING BASINS

Negligible amounts of sediment have been deposited in Ohio's 5 Miami Conservancy District retarding basins during 40 yr of operation. Earth dams, 65 ft to 110 ft high, were designed to pass medium and low flows but to retard flood flows. Sedimentation increases as detention time increases and sediments of longer detention have a higher clay content. Trap efficiencies of the basins are in the 10% to 40% range for the few days each yr that they store water. Sedimentation is not a major problem in the dry retarding basins operated for flood control purposes.

R203241X68A

Curtis, Lamont W, Jr

SEDIMENTATION IN RETARDING BASINS

Proc Amer Soc Civ Eng, J Hydraul Div, Vol 94, No HY3, pp 739-744, May 1968. 6 p, 4 tab, 3 ref, append

Havens and Emerson, Consulting Engineers, Cleveland, Ohio

DESCRIPTORS--/ hydraulics/ *sedimentation/ *reservoirs/ particle size/ *flood control/ clays/ dam design/ hydrology/ velocity/ suspended sediments/ *silting/ impoundments/ Ohio/ low flow/ *trap efficiency/ *reservoir silting/ reservoir storage/ floodwater/ suspended load

IDENTIFIERS--/ *retarding basins

R203242X68A EFFECTS OF DENSITY RATIO ON SEDIMENTARY SIMILITUDE

Experimental work reveals that significant similarity may be achieved in certain cases of sedimentary phenomena without satisfaction of equality of density ratio. The equation of motion of particles falling in a vertically oscillating fluid column is made dimensionless by a linear scale which minimizes the effect of density ratio. It is shown that average fall velocity of particles in such circumstances is less than terminal settling velocity in still fluid. By a combination of dimensional analysis and physical reasoning, scale ratios are derived which give better correlation for various density ratios in the experimental case of scour phenomenon here considered than those suggested previously.

R203242X68A

Field, Walter G

EFFECTS OF DENSITY RATIO ON SEDIMENTARY SIMILITUDE

Amer Soc Civ Eng, J Hydraul, Vol 94, No HY 3, Pap 5948, pp 705-719, May 1968. 15 p, 5 fig, 2 tab, 7 ref, 2 append

University of Newcastle, New South Wales, Australia

DESCRIPTORS--/ *dimensional analysis/ hydraulics/ *sedimentation/ flow/ scour/ velocity/ prototype tests/ density/ erosion/ flow/ particle size/ sands/ settling velocity/ *experimental models/ particle shape/ analytical techniques

IDENTIFIERS--/ *sedimentary similitude/ *density ratio

R20324TX68A BANKFUL FREQUENCY IN RIVERS
The mean frequency with which streams exceed bankful level is examined using gaging-station data from New South Wales, Australia. The claim that bankful levels are remarkably constant is suspect because reported frequencies range from 1 or 2 yr to 5 yr. Because of possible recent incision of flood plains, 3 channel benches named "high," "middle," and "low" are considered as well as the flood plain. The high bench is not present everywhere and is assumed to be the flood-plain equivalent. Statistical analysis indicates a reasonable probability that the grouped bankful frequencies for the high bench and flood-plain levels represent one frequency distribution. That frequency, based on data from drainage areas ranging from 174 to 220,000 sq mi, is 1.24 to 2.69 yr (in terms of annual maximum series). The middle bench also seems to be associated with a constant bankful frequency ranging from 1.02 to 1.21 yr. The recognition of stream benches is important in identifying the active flood plain or equivalent level and in distinguishing flood plains from terraces. Channels and benches are illustrated by photographs and drawings, and statistical data are given in tables. Has 17 references.

R203247X68A

Woodyer, K D

BANKFUL FREQUENCY IN RIVERS

J Hydrol, Vol 6, No 2, pp 114-142, Apr 1968. 29 p, 11 fig, 7 tab, 17 ref

Division of Land Research, CSIRO, Canberra, Australia

DESCRIPTORS-/ frequency/ hydraulics/ *streamflow/ flood plains/ banks/ *geomorphology/ streams/ rivers/ channels/ hydrology/ surface waters/ frequency analysis/ gaging stations/ *alluvial channels/ river beds/ channel flow/ floods/ natural streams/ foreign research/ terraces (geological)
IDENTIFIERS-/ *flood probability/ stream benches/ annual floods/ Australia

R203254 68A QUALITY CONTROL OF COEFFICIENTS IN SEDIMENT STUDIES
Alinement charts and a simplified procedure are given for quality evaluation and control in sediment studies. Data variations whether by measurement error or natural variation are resolved by a simplified exercise to determine the quality of the mean, and can be computed with simple tabulation and a nomograph. Procedures also are presented for estimating coefficient quality and developing criteria to determine the necessary observations required for the numerator and denominator of a desired ratio. The evaluation of adjustment coeffients commonly used to adjust single-vertical measurements of suspended-sediment concentration by measuring the cross-sectional concentration is illustrated. The method described is less cumbersome than the algebraic method for evaluating a mean or the ratio of 2 means of sediment concentration.

R203254 68A

Guy, Harold P

QUALITY CONTROL OF ADJUSTMENT COEFFICIENTS USED IN SEDIMENT STUDIES

Geol Surv Prof Pap 600-B, pp B165-B168, 1968. 4 p, 2 fig, 5 tab, 1 ref

Geological Survey, Fort Collins, Colo

DESCRIPTORS--/ quality control/ streams/ sampling/ nomographs/ *sediment load/ coefficients/ *sedimentation/ sediments/ sediment distribution/ *statistical methods/ evaluation/ suspended load/ data collections

IDENTIFIERS--/ Snedecor method

R203262 67A WATERSHED HYDRAULICS IN THE LABORATORY
Laboratory facilities are basic ingredients in the understanding of the hydromechanic behavior of natural watersheds. The significant variables which influence time of concentration, time to equilibrium, time to peak, lag time, etc., are readily observable, thus providing an insight into the hydromechanic behavior of watersheds. This paper is devoted to a discussion of the characteristics of the time distribution of runoff (hydrograph) with comments on lag time, time to peak, and other characteristic time responses of watersheds. Various definitions concerning the concept of time of concentration exist in hydrologic literature. The general definition, "the time it takes a drop of water to travel from the uppermost part of the watershed to the outlet," is shown to be in direct contradiction to the definition "the time it takes a watershed to attain maximum discharge when subjected to a constant intensity rainfall." Has 19 references.

R203262 67A

Harbaugh, Terence E

WATERSHED HYDRAULICS IN THE LABORATORY

Pap, 3rd Annu Amer Water Resour Ass, San Francisco, Calif, Nov 1967. 19 p, 5 fig, 19 ref

University of Missouri, Rolla

DESCRIPTORS--/ hydrologic data/ flood peaks/ *hydraulic models/ flood forecasting/ bibliographies/ *watersheds/ runoff/ surface runoff/ time lag/ hydrology/ rainfall/ rainfall intensity/ rainfall simulators/ time of concentration/ rainfall-runoff relationships/ overland flow

IDENTIFIERS--/ *hydrologic models/ flood hydrology

R203264 68A SUCCESSFUL ICE DUSTING AT FAIRBANKS, ALASKA
The presence of ice jams during spring breakup and the resultant flooding of rivers has always been an interesting aspect of life in Alaska and other northern areas. As the populations of these areas grow, however, the economic cost of permitting these jams and floods can become intolerable. Consequently, methods of jam prevention or elimination are being sought. Much work has been done, particularly by the Corps of Engineers, to develop methods of destroying jams once they have occurred. In many areas these curative measures seem to be the most practical solution. In highly developed areas, however, it may be more feasible to prevent the jam from forming rather than to destroy it following its formation. This paper describes one apparently successful attempt to prevent jamming, and potentially severe flooding, by the use of coal dust and fly ash to increase the absorption of solar radiation and hasten breakup.

R203264 68A

Cook, R Gordon and Wade, Mason D

SUCCESSFUL ICE DUSTING AT FAIRBANKS, ALASKA, 1966

Proc Amer Soc Civ Eng, J Hydraul Div, pp 31-41, Jan 1968. 11 p, 16 fig, 2 ref

University of Alaska, College

DESCRIPTORS--/ ice prevention/ *solar radiation/ flood protection/ freezing/ *dusting/ *ice/ *coal/ ice loads/ *ice jams/ floods/ *coals/ *ice breakup

IDENTIFIERS--/ ice forming/ *Alaska/ ice control/ Chena River, Alaska

R203266 68A FLOW CHARACTERISTICS IN AN OPEN CHANNEL
Application of a method of velocity determination in an open channel using a microscope and camera to record the motion of small particles suspended in water is described. Velocity measurements were made in a series of thin planes orientated parallel to channel bottom for the case of 2-dimensional laminar and turbulent open channel flow. Velocity profiles near the boundary were plotted and boundary shear computed from the rate of shear thus determined. Turbulence intensity was computed and the distribution of particle velocities examined. The method yields boundary shear values to within plus or minus 15% and this uncertainty can be reduced significantly. Maximum error is caused by uncertainty in location of the focal plane and in location of a particle within the focal plane. This difficulty causes greater error in computation of turbulence intensity. The error increases as distance from the boundary decreases. Particle velocity distributions exhibit a positive third moment which is in qualitative agreement with previous measurements. Has 20 references.

R203266 68A

Wenzel, Harry G and Mathews, Michael J

MICROSCOPIC DETERMINATION OF BOUNDARY SHEAR AND SUBLAYER TURBULENCE CHARACTERISTICS IN AN OPEN CHANNEL

Water Resour Center Res Rep 13, Univ Ill, Jan 1968. 78 p, 25 fig, 3 tab, 20 ref

University of Illinois, Urbana

DESCRIPTORS--/ density/ viscosity/ shear stress/ Reynolds number/ data reduction/ boundary shear/ settling velocity/ *open channel flow/ *flow characteristics/ optical instruments/ motion pictures/ microscopy/ two-dimensional/ *turbulent flow/ turbulence/ *laminar flow/ hydraulics/ bibliographies
IDENTIFIERS--

R203269 67A EROSION EFFECT ON INFILTRATION RATES
Various soils in Missouri were studied to determine water infiltration rates and the effect of erosion on infiltration rates. Results showed that the effect of antecedent moisture on the infiltration rate is also dependent on other factors. Factors of major influence are crop cover, degree of aggregation, and bulk density. Results showed effect of antecedent moisture on the infiltration rates was greatest when the soil was bare and well tilled. In clay pan soils, when volume above the clay layer has been filled, infiltration rate is then the rate at which water can percolate the clay layer. Results in some cases seem to contradict results of previous researchers in that they have reported antecedent moisture as a major factor in influencing the infiltration rate. The final infiltration rate is affected only to a minor extent by the antecedent moisture. Bulk density and degree of aggregation can have a large effect on the infiltration rate. These factors change throughout the year with tillage practices, freezing and thawing of the soil and soil moisture. Consequently, infiltration rates change accordingly. The infiltrometer which has been developed is a quick, convenient, and reliable device whereby pertinent data can be obtained. Has 26 references.

R203269 67A

Powell, G M and Beasley, R P

EFFECT OF EROSION ON WATER INFILTRATION RATES

Res Bull 922, Univ Missouri, Apr 1967. 48 p, 23 fig, 5 tab, 26 ref

University of Missouri, Columbia

DESCRIPTORS--/ *soil erosion/ *erosion/ *infiltration/ runoff/ soils/ surface runoff/ grasses/ bibliographies/ cover crops/ soil physical properties/ soil moisture/ soil science/ agriculture/ instrumentation/ measuring instruments/ aggradation/ infiltrometers/ Missouri/ rainfall simulators
IDENTIFIERS--

R203273 68A TIME OF TRAVEL OF WATER, THE GREAT MIAMI RIVER, OHIO
A time-of-travel study, using a soluble dve (Rhodamine BA). was made of the Great Miami River during low streamflow in July and August 1965, to obtain basic information about water movement in the 71.3 mi reach between Dayton and Cleves, Ohio. A slug of dye was injected at the head of a subreach, and its concentration at selected downstream sites was measured with a fluorometer. Traveltimes were 182 and 254 hr for index discharges of 550 and 380 cfs, respectively, at Miamisburg. Peak traveltimes averaged 91% of the centroid traveltimes for the reach. Traveltimes computed by the average-velocity method were less than those for the centroid of the dye cloud. A method of using a straight-line log-log plot of traveltimes versus index discharge to predict traveltimes is stated. The resulting equation, T = 400 x 10 squared x 1/Q to .85 power, is applicable for a discharge range of 300-800 cfs. Data for the two traveltime runs are tabulated and plotted on graphs showing elapsed time versus river miles.

R203273 68A

Bauer, Daniel P

TIME OF TRAVEL OF WATER IN THE GREAT MIAMI RIVER, DAYTON TO CLEVES, OHIO

Geol Surv Circ 546, 1968. 15 p, 8 fig, 6 tab, 4 ref

Geological Survey, Washington, D C

DESCRIPTORS--/ methodology/ dispersion/ streamflow/ *velocity/ *tracers/ stream gages/ streamflow records/ hydrology/ Ohio/ *dye releases/ river forecasting/ *low flow/ *flow rates/ water circulation/ fluorometry/ discharge (water)

IDENTIFIERS--/ fluorometers/ average velocity method/ *travel time

R203280 68A REMOTE SENSING OF DYE TRACER IN HYDROLOGIC STUDIES
Several systems for detection of rhodamine B dye are described as useful in determining the movement and dispersion of soluble contaminants in streams and estuaries. All systems undergo interference from sun reflections ("glitter"), imaging less than other systems since areas of "sun glitter" can be seen and neglected in image analysis. The narrow-band interferometer system, which reduces background effects, is useful for low dye concentrations under minimum "sun glitter." It is the only system applicable to general luminescence. The photographic system requires film analysis by densitometer to obtain concentration values. A photometer or a television scanning system is processed electronically, as time data are taken, to give a read out of vertically integrated amounts of dye. A geometric explanation is given for specular reflection of direct sunlight from water waves. This technique may allow use of a line-depth method under "glitter" conditions.

R203280 68A

Betz, H T

THE REMOTE MEASUREMENT OF RHODAMINE B CONCENTRATION WHEN USED AS FLUORESCENT TRACER IN HYDROLOGIC STUDIES

Tech Lett NASA-101, Jan 1968. 52 p, 6 fig, 8 tab, 6 ref, append

IIT Research Institute, Chicago, Ill

DESCRIPTORS--/ aerial photography/ fluorescence/ hydrologic data/ water quality/ streams/ estuaries/ tracers/ dispersion/ turbidity/ *remote sensing/ absorption/ *dye releases/ *tracking techniques/ wavelengths/ photometry/ waste water (pollution)

IDENTIFIERS--/ *fluorescent tracers/ densitometers/ *rhodamine B/ tracking/ *multispectral scanning

HYDROLOGY

R203283 68A CREST-STAGE GAGING STATIONS, OREGON 1967
The report tabulates stage and discharge data associated with recorded floods at 151 crest-stage stations in Oregon. The stations are distributed in all parts of the state, except the extreme southeastern part. Data are presented for the 1967 water yr; data for earlier yr were tabulated in a previous report. The crest-stage gaging stations are operated to provide information on flood characteristics for small drainage basins.

R203283 68A

Anon

CREST-STAGE GAGING STATIONS IN OREGON

Geol Surv Rep, Jan 1968. 8 p, 1 fig, 6 tab

Geological Survey, Portland, Oreg

DESCRIPTORS--/ streamflow/ hydrologic data/ streams/ gaging stations/ discharge measurement/ flood peaks/ Oregon/ *floods/ *small watersheds/ *stage-discharge relations/ discharge (water)/ *peak discharge

IDENTIFIERS--/ *crest-stage stations/ peak stages

IRRIGATION

R203074X68A HEAD-LOSS TABLES FOR SPRINKLER LATERALS
The choice of pipe diameters for sprinkler irrigation lateral pipe depends on an evaluation of head losses which, generally, are computed only approximately. The current procedure for computing these head losses in sprinkler laterals is reviewed. Head-loss expressions to account for pipe flow and quick and branching-flow couplers are developed. These expressions facilitate computing pressure heads at end sprinklers on a lateral. The required parameters are: (1) diameter of the lateral, (2) number of sprinklers, (3) operating conditions for the selected sprinkler, (4) sprinkler spacings, and (5) tubing lengths. The expressions can be used to prepare tables for selecting proper lateral diameters. Preparation and use of tables for 3-in. horizontal aluminum laterals are demonstrated.

R203074X68A

Benami, Amnon

NEW HEAD-LOSS TABLES FOR SPRINKLER LATERALS

Proc Amer Soc Civil Eng, J Irrig Drain Div, Vol 94, No IR2, pp 185-197, June 1968. 13 p, 2 tab, 9 ref, 2 append

Israel Institute of Technology, Haifa

DESCRIPTORS--/ *head losses/ *sprinkler irrigation/ irrigation systems/ irrigation/ *laterals/ pressure pipes/ couplings/ aluminum/ fluid flow/ pipelines/ rigid tubing/ slopes/ hydraulics/ *design data/ flow/ fluid friction

IDENTIFIERS--/ diameters/ bifurcations

R203095X68A CENTER-PIVOT SPRINKLER IRRIGATION SYSTEM
A self-propelled center-pivot system that will irrigate one-quarter section of land is a recent innovation of sprinkler manufacturers. The effectiveness of this equipment was studied using established guidelines of the ASAE. Mathematical equations are given for application depths and rates, and a method for evaluating the uniformity of application depths is presented. Theoretical solutions for distribution of application depths from a center-pivot sprinkler system are compared with field measurements. Distribution of the application rate radially from the center pivot is shown. The analysis provides the formulation necessary for proper design of a self-propelled center-pivot sprinkler irrigation system.

R203095X68A

Heermann, D F and Hein, P R

PERFORMANCE CHARACTERISTICS OF SELF-PROPELLED CENTER-PIVOT SPRINKLER IRRIGATION SYSTEM

Trans Amer Soc Agr Eng, Vol 2, No 1, pp 11-15, Jan-Feb 1968. 5 p, 8 fig, 3 tab, 4 ref

Colorado State University, Fort Collins

DESCRIPTORS--/ *irrigation systems/ *sprinkler irrigation/ performance tests/ field tests/ distribution systems/ distribution/ irrigation/ automatic control

IDENTIFIERS--/ application techniques/ equations/ formulas/ depth

R203114 67A EFFECTS OF IRRIGATION ON SAFFLOWER YIELD
An experiment was conducted to determine yield responses of safflower to varying amounts of water applied in pre-irrigation and supplemental crop irrigations on Panoche clay loam soil in Fresno county. Fertilization prior to pre-irrigation was uniform. Fifteen pounds of U S 10 safflower variety (per acre) were drilled in two rows on each 40-inch bed spaced 20 inches apart. Individual test plots were 24 ft wide and 600 ft long replicated five times. Highest yields of safflower were obtained when a medium pre-irrigation of 18 inches and two supplemental 8-inch crop irrigations were applied. When approximately the same total amount of water was applied in one pre-irrigation or in a pre-irrigation and one supplemental crop irrigation the yields were significantly lower. This study suggested that maximum safflower yields (on Panoche clay loam soil) depend on readily available soil moisture in the top 4 ft of soil during bud and flowering periods.

R203114 67A

Fischer, B B; Yamada, H; Pomeroy, C R

EFFECTS OF IRRIGATION PRACTICES ON SAFFLOWER YIELD IN SAN JOAQUIN VALLEY

California Agr, Vol 21, No 11, pp 6-7, Nov 1967. 2 p, 4 fig, 3 tab

University of California, Division of Agriculture Science, Fresno

DESCRIPTORS--/ irrigation/ soil moisture/ *irrigation practices/ clay loam/ *supplemental irrigation/ timing/ crop production

IDENTIFIERS--/ *safflower

IRRIGATION

R203141X67A ADVANCES IN WATER HARVESTING

Water Harvesting, the practice of collecting water from an area treated to increase runoff from rainfall and snowmelt, has been utilized in many countries and for a length of time. In the US, however, the expense of building such facilities has prevented use. Increased water needs will undoubtedly lead to increased water harvesting. Four low-cost methods are described. The first, sprayed asphalt catchments, showed considerable promise. They collected nearly 100% runoff precipitation, were strong and durable, and were low cost; however, they gave off oxidation products in regions of high solar radiation and low precipitation. The second, plastic sheeting catchments, were low cost but were not durable unless a protective layer of gravel was used. This decreased the percentage of collection. The third, sodium-treated catchments, was very low cost and may yield more than 70% runoff but created an erosion problem. The last is soil treated with water repellants, the most promising of which is sodium methyl silanolate. Although much research remains, current work has shown costs can be reduced initially to 10¢ per sq yd with an annual maintenance of 2¢ per sq yd.

R203141X67A

Myers, Lloyd E

RECENT ADVANCES IN WATER HARVESTING

J Soil Water Conserv, Vol 22, No 3, pp 95-97, May-June 1967. 3 p, 2 fig

U S Water Conservation Lab, Phoenix, Ariz

DESCRIPTORS--/ plastics/ runoff/ sodium compounds/ spraying/ asphalt/ *atmospheric precipitation/ soil stabilization/ emulsions/ repellants/ asphaltic concrete/ rubber/ *water collection systems/ *soil sealants/ *water harvesting/ watersheds (basins)/ sealants/ water costs

IDENTIFIERS--

MATERIALS ENGINEERING

R203056X68A DEVELOPMENT OF NONDESTRUCTIVE TESTING

The past and present status and future development of nondestructive testing are examined. Current definitions limit the scope of nondestructive testing to radiographic, ultrasonic, eddy current, and surface penetration methods; a wider perspective might include such diverse methods as egg candling, specific gravity determinations, glass bottle ringing, leak testing, infrared detection, and X-ray fluorescence spectrography. Historical aspects, activities of testing societies, and current technological developments are reviewed to provide background for a commentary on developing and expanding the art. Future expansion depends on training personnel, research on new methods, and extending the applications of nondestructive testing. Central training centers are needed to coordinate teaching and compete with demand. The paper concludes that the scope of nondestructive testing needs clarification, and a concerted effort is needed to evolve new methods and embrace related techniques of quality control and critical path analysis. Planned development is recommended. Has 18 references.

R203056X68A

Mullins, Leslie

THE DEVELOPMENT OF NONDESTRUCTIVE TESTING

Mater Evaluation, Vol 26, No 6, pp 93-105, June 1968. 13 p, 1 fig, 3 photo, 18 ref

Kodak Ltd, Harrow, Great Britain

DESCRIPTORS-- / *nondestructive tests/ *materials testing/ radiographic inspection/ technologists/ X-ray analysis/ quality control/ inspection/ cracks/ reviews/ research and development/ test procedures/ training/ metals testing/ welded joints/ schools/ technical societies/ bibliographies

IDENTIFIERS--/ ultrasonic tests/ eddy currents/ foreign testing/ Great Britain

R203093X68A CYCLIC CONDENSATION HUMIDITY CABINET

Accelerated corrosion testing of preservative oils and compounds in humidity cabinets does not provide reproducible and repeatable results. Continuous condensation cabinets, such as the Joint Army Navy Specification JAN-H-792 humidity cabinet, salt spray, and fog cabinets are inadequate because of random condensation and washing action of the condensate on test specimens. Improved cabinets, using a controlled temperature differential to establish condensation, intensify corrosion conditions to the extent of changing the relation of test exposure with actual humid environment. Corrosion tests should simulate actual exposure conditions on an accelerated basis. These conditions can be achieved only by reproducing the diurnal cycle with independent controls for air temperature, air humidity, and sample temperature. A JAN-H-792 humidity cabinet was modified to provide these controlled conditions. This cabinet produces uniform reproducible corrosion patterns on test specimens, and can be adapted for evaluating finishes, treatments, painted surfaces, preservatives, and packaging films. Construction details, operating data, and limited performance data of the cabinet are given.

R203093X68A

Minuti, D V and Bowen, J H

A CONTROLLED CYCLIC CONDENSATION HUMIDITY CABINET

Mater Res Stand, Vol 8, No 6, pp 33-41, June 1968. 9 p, 10 fig, 1 tab, 6 ref

Naval Air Development Center, Washington, D C

DESCRIPTORS--/ *materials testing/ *testing machines/ weathering/ test procedures/ *environmental tests/ condensation/ temperature/ protective coatings/ paints/ *humidity/ exposure/ corrosion/ temperature control/ preservation/ test facilities

IDENTIFIERS--/ accelerated testing/ testing equipment/ *corrosion tests/ *humidity cabinets

R203048X68A UNPRECEDENTED TEHACHAPI PUMP PLANT LIFT

The Tehachapi Pumping Plant, located at the north base of the Tehachapi Mountains 70 mi morth of Los Angeles, will lift 4,100 cfs of water about 2,000 ft. This will be the highest pump lift in the USA and 1 of the largest in the world. Millions of dollars in additional construction costs could result from overconservative methods in designing the discharge line for the internal pressure, and in the elastic stability analysis for external pressure. Therefore, the most recent research work in many varied fields of engineering was introduced into practical construction. This paper presents some of the concepts used to refine the design of the discharge line tunnels, and the computer programs used to optimize the final design.

R203048X68A

Jain, Ravinder K; Griffith, A R; Stephens, M N

THE UNPRECEDENTED LIFT--TEHACHAPI PUMPING PLANT DISCHARGE LINES

Proc, Western Water Power Symp, pp B-51-B-61, Apr 1968. 11 p, 6 fig, 8 ref

California State Department of Water Resources, Sacramento

DESCRIPTORS--/ *lift/ *high pressures/ pipelines/ *pressure tunnels/ *tunnels/ head losses/ water hammer/ tunnel linings/ models/ model tests/ hydraulics/ stiffening/ surge tanks/ external forces/ internal forces/ tunnel design/ water tunnels (conveyance)/ *steel linings/ hydrostatic pressures/ engineering geology/ pumping plants
IDENTIFIERS--/ *discharge lines/ *pressure head/ *Tehachapi Pump Plant, Calif/ California/ cost savings

R203049X68A PUMP SELECTION FOR TEHACHAPI PUMP PLANT
Many complex problems were encountered in selecting the pumps for the high lift of the monumental Tehachapi Pumping Plant in California. A single-lift concept was chosen and a special research and development program carried out to select the optimum type of pump and to prepare specifications for fabrication. The program included special model testing, as well as analytical and other studies. After selection of a 4-stage centrifugal pump, manufacturers were prequalified and commissioned to build large-scale models. These models were tested in an independent laboratory, and results used to evaluate efficiency in relation to pump cost. The program resulted in receipt of bids for equipment having substantially greater efficiency than available heretofore. Basic pump design parameters are discussed.

R203049X68A

Miller, David R

SELECTION OF FOUR-STAGE PUMPS FOR THE TEHACHAPI PUMPING PLANT

Proc, Western Water Power Symp, pp B-1-B-11, Apr 1968. 11 p, 5 ref

Daniel, Mann, Johnson, and Mendenhall, Los Angeles, Calif

DESCRIPTORS--/ *pumps/ *pumping plants/ high pressures/ wear resistance/ *centrifugal pumps/ hydraulic models/ model tests/ reliability/ costs/ vibrations/ hydraulic transients/ efficiencies/ cavitation/ pump tests/ cost comparisons/ specific speed/ lift

IDENTIFIERS--/ alternative costs/ *high head/ evaluation/ *Tehachapi Pump Plant, Calif/ California

R203068X68A VALVE ENGINEERING FOR WATER SUPPLY
Engineering development is a continuous process derived either singly or collectively from improvements in design, materials, or application. The valve manufacturing industry is attaining more efficient production through rationalization, a process of simplification and standardization. Design improvement is the most obvious field of development and has 4 objectives: (1) improved hydraulic or mechanical performance; (2) minimum dimensional requirements, taking advantage of improved qualities of established and new materials; (3) use of new manufacturing methods to increase productivity; and (4) maximum standardization and interchangeability of components. Improved existing materials and newly developed better materials have influenced valve manufacturing. The range of application of valves can be extended through a more extensive knowledge of hydraulic flow conditions. The general background of valve development is reviewed, and the effect of these developments on the design and use of gate, butterfly, air, check, regulating, and terminal discharge valves is discussed.

R203068X68A

Miller, E

DEVELOPMENTS IN VALVE ENGINEERING FOR WATER SUPPLY

J Inst Water Eng, Vol 22, No 2, pp 91-128, Mar 1968. 38 p, 19 fig, 1 tab, 9 ref, disc

Glenfield and Kennedy, Ltd, Kilmarnock, Scotland

DESCRIPTORS--/ *valves/ *butterfly valves/ *check valves/ *gate valves/ mechanical engineering/ manufacturing/ design/ materials/ water supply systems/ corrosion control/ cavitation/ flow/ hydraulics/ water seals/ hydrodynamics/ *hydraulic gates and valves/ hollow jet valves/ needle valves/ high pressure valves

IDENTIFIERS--/ Great Britain/ foreign research/ hydraulic valves/ valve seats

R203099X68A VIBRATION & BALANCING OF FLEXIBLE SHAFTS

Vibration of rotating flexible shafts is a very important problem in many branches of engineering. A rotating shaft can experience a whole range of vibration phenomena. Vibration may be forced, transient, or self-excited. Forced vibration (or whirling) resulting from unbalance is the most important common type of vibration in a rotating flexible shaft and is discussed in this paper. A rotating shaft suffers from unbalance if its mass axis does not coincide exactly with the elastic axis. The following topics are reviewed: (1) motion of a rigid rotor supported on a massless flexible shaft; (2) motion of a massive flexible rotor; (3) balancing flexible shafts; (4) departures from axial symmetry; (5) other aspects of shaft vibration such as oil whirl, massive flexible foundations, gyroscopic and rotary inertia effects, acceleration and retardation of shafts, and axial torque and thrust; and (6) methods of measuring shaft vibration. Has 93 references.

R203099X68A

Bishop, R E D and Parkinson, A G

VIBRATION AND BALANCING OF FLEXIBLE SHAFTS

Appl Mech Rev, Vol 21, No 5, pp 439-451, May 1968. 13 p, 1 fig, 93 ref

University College, London, Great Britain

DESCRIPTORS--/ *mechanical engineering/ *vibrations/ motion/ rotation/ *shafts (machinery)/ mechanical equipment/ rotating components/ torque/ bibliographies/ moments of inertia/ transients/ accelerating/ frequency/ thrust/ deceleration/ analysis/ damping/ bearings/ generators/ turbines/ investigations/ measurement/ *hydraulic machinery
IDENTIFIERS--/ foreign research/ Great Britain/ harmonics/ gyroscopic effects/ *balancing/ *rotors/ turbogenerators

R203058 68A CONTROL OF WEATHER MODIFICATION

This paper discusses the administration and legal aspects of weather modification. Although society favors elimination or suppression of hail or tornadoes, disputes will arise over attempts to increase precipitation. Ligitation between conflicting interests can be anticipated; appropriate liability doctrines must be formulated and applied to resolve these conflicts. Weather modification in the United States is traced from a discovery in 1946 that dry ice and silver iodide induce precipitation in supercooled clouds. Development of private law doctrines and cases involving weather modification are discussed; 23 states have enacted statutes dealing specifically with weather modification. Congress and Federal agencies have been concerned primarily with investigating and coordinating weather modification rather than regulating it. Proposed legislation now before Congress is discussed, and possible legal and administrative solutions to control weather modification are analyzed. An organization under the United Nations should be established to exercise control of weather modification since weather has no geographical boundaries. Has 145 references.

R203058 68A

Corbridge, James N Jr and Moses, Raphael J

WEATHER MODIFICATION: LAW AND ADMINISTRATION

Natur Resources J, Vol 8, No 2, pp 207-235, Apr 1968. 29 p, 145 ref

University of Colorado, Boulder

DESCRIPTORS-/ *weather modification/ weather/ rain/ rainfall/ storms/ bibliographies/ governments/ *administration/ *laws/ control/ cloud seeding/ benefits/ history/ *meteorology/ *artificial precipitation

IDENTIFIERS--/ *legal aspects/ legislation

R203121X67A AGROMETEOROLOGICAL ASPECTS OF DEW

A review of the literature on dew discusses the following: dew measurement, dew and plant development, dew forecasting, and dew and plant pest development. The results of a number of dew measurement studies are presented, the majority of which deal with amount rather than duration. No standardized method of dew recording exists today making data comparison impossible. The effects of dew on plant development are reviewed with particular stress on its importance in arid and semiarid lands. Effects of relative humidity on dew formation, suppression of transpiration, dew assimilation through leaves and amount of dew compared to quantity of rainfall are reported. Methods of dew forecasting are given based on some combinations of the following factors: nocturnal cooling rate, dew point, wind speed, air temperatures, vapor pressure, and radiation. Several accounts are given of dew formation being favorable to the infection processes of plants by bacteria and fungi. Specific examples include wheat stem rust, apple scab fungus, downy mildew of sugar beet, and the late blight fungus. Has 151 references.

R203121X67A

Wallin, Jack R

AGROMETEOROLOGICAL ASPECTS OF DEW

Agr Meteorol, Vol 4, No 2, pp 85-102, 1967. 18 p, 1 tab, 151 ref

U S Department of Agriculture, Ames, Iowa

DESCRIPTORS--/ evapotranspiration/ diseases/ bacteria/ plant (botany)/ *dew/ humidity/ *dew point/ hygrometry/ rusts/ air temperature/ vapor pressure/ bibliographies/ radiation/ plant diseases/ mildews/ scabs/ fungi/ microenvironment/ blights/ wind velocity/ plant growth

IDENTIFIERS--

R203124 67A SYNOPTIC CLIMATOLOGY OF THE WEST

A synoptic climatology of precipitation resulting from 645 upper closed lows was developed for the intermountain area of the West for the winter months of December, January and February. The deviation of the synoptic climatology was carried out by electronic computer. Precipitation amounts at about 280 stations for 12 hour periods, centered at upper-air observation times and expressed as percentages of 7-day normal station amounts, were related to the positions of low centers at the 700 millibar level through the use of a moving grid system. The upper lows were classified into three intensity categories according to the departure from normal of the central height. For each category, the average precipitation amount, extent, and frequency of occurrence over the area of the grid system was presented. The area of maximum precipitation was found just southeast of the centers of intense 700 millibar lows. As the intensity of the low center decreased, the frequency of precipitation diminished and the area of maximum frequency shifted to positions south and west of the center.

R203124 67A

Jorgenson, Donald L; Klein, William H; Korte, A F

A SYNOPTIC CLIMATOLOGY OF WINTER PRECIPITATION FROM 700-mb LOWS FOR INTERMOUNTAIN AREAS OF THE WEST

J Appl Meteorol, Vo. 6, No 5, pp 782-789, Oct 1967. 8 p, 11 fig, 13 ref, append

Weather Bureau, ESSA, Silver Spring, Md

DESCRIPTORS--/ meteorological data/ climatology/ synoptic analysis/ computer programs/ precipitation (atmospheric)/ weather patterns/ climatic data

IDENTIFIERS--/ weather data/ precipitation rate/ climatic formulas/ intermountain west, USA/ Western United States

R203133 68A VARIATION IN SUMMER RAINFALL DISTRIBUTION
In southeastern Arizona, almost all summer rainfall results from widely-scattered high-intensity afternoon or evening thunderstorms of limited areal extent. On the 58-sq-mi Walnut Gulch Watershed in Tombstone, Arizona, about 70% of the annual rainfall of 11-1/2 inches for the 11-yr period of record (1954-1964) fell in July, August, and early September. Over 95% of the annual runoff occurred during this same period. In contrast, about 5% of the rainfall occurred in April, May, and June, and about 25% in the remaining 6-1/2 months. Although highly variable, the July-August rainfall represented the most dependable source of water to the Walnut Gulch Watershed, and rainy and drought periods within this 2-month period most influenced plant growth and surface conditions and indirectly influenced runoff. On the average, significant rainfall was recorded on some part of the watershed on 40% of the days during this critical period. The maximum frequency was 3 out of every 4 days in 1955 and the minimum was 3 out of every 10 days in 1960. The wettest year was 1955, with a continuous rainy period of 47 days, whereas the driest was 1960, with the longest rainy period lasting 5 days. The longest summer drought during the period of record occurred in 1962, when no rain fell for 17 days in August.

R203239 68A

Weaver, R L

METEOROLOGY OF MAJOR STORMS IN WESTERN COLORADO AND EASTERN UTAH

ESSA Tech Memo WBTM HYDRO 7, Weather Bur, Jan 1968. 75 p, 39 fig, 13 tab, 12 ref

ESSA Weather Bureau, Washington, D C

DESCRIPTORS--/ climatology/ hydrology/ meteorology/ moisture/ *storms/ mountains/ *rainfall intensity/ topography/ *rainfall/ advection/ air circulation/ air masses/ marine air masses/ orography/ storm structure/ precipitation (atmospheric)/ *rainfall disposition/ *weather patterns/ winds
IDENTIFIERS--/ western Colorado/ eastern Utah

R203210 68A CHEMICAL COMPOSITION OF PRECIPITATION, N C AND VA
Results of chemical analyses of monthly atmospheric precipitation samples from 12 collection sites over a 2-yr period show small annual changes in loads and geographical distribution of sulfate and nitrate in the piedmont and coastal plains of North Carolina and southern Virginia. Sulfate and nitrate loads were 7 and 2 tons respectively, per sq mi in the interior and less near the coast, and chloride loads were 2.1 and 1.8 respectively. Cation concentrations differ considerably from year to year and apparently depend on soil dust. Reaction of an acidic sulfur-containing aerosol with an alkaline calcium source is probably a principal control on rainfall alkalinity and pH. Ions in rainfall contribute substantially to surface-water quality; precipitation input and stream export for 4 rivers show that rainfall sulfate is equal to sulfate discharged, whereas nitrate in rain exceeds stream nitrate. Cation contributions from rainfall range from 20% for potassium to 50% for calcium. Presence of 3 types of aerosols--marine, acidic, and alkaline--are inferred from results of the study. Has 15 references.

R203210 68A

Fisher, Donald W

ANNUAL VARIATIONS IN CHEMICAL COMPOSITION OF ATMOSPHERIC PRECIPITATION, EASTERN NORTH CAROLINA AND SOUTHEASTERN VIRGINIA

Geol Surv Water-Supply Pap 1535-M, pp M1-M21, 1968. 21 p, 17 fig, 1 tab, 15 ref

Geological Survey, Washington, D C

DESCRIPTORS--/ rainfall intensity/ *ions/ sulfates/ nitrates/ aerosols/ leaching/ drainage/ water quality/ salinity/ streamflow/ ecological distribution/ *precipitation (atmospheric)/ *chemistry of precipitation/ North Carolina/ watersheds (basins)/ ion transport

IDENTIFIERS--/ *acidic rainfall/ nitrate load/ chloride load/ sulfate load/ *alkaline soil dust/ cation content

R203224 67A NUCLEAR RADIATION SNOW GAGE
The measurement of water stored in snowpacks is important to determine the efficient utilization of this water. Various methods have been used for this measurement but have not provided accuracies sufficient for precision analyses. Nuclear radiation is shown to be a useful tool for nondestructive water equivalent measurement. The scintillation detector was selected as a desired instrument, and the selection criteria, design features, and performance are presented. Although a unit of relatively high cost, this detector is shown to be capable of arbitrarily high resolution.

R203224 67A

McKean, George A

A NUCLEAR RADIATION SNOW GAGE

Bull 13, Univ Idaho, Aug 1967. 48 p, 15 fig, 10 ref

University of Idaho, Moscow

DESCRIPTORS--/ *snow/ *snow surveys/ measuring instruments/ attenuation/ density/ snowmelt/ radio waves/ water yield/ moisture content/ radiation measurement/ gamma rays/ precipitation gages/ *nuclear moisture meters/ remote sensing/ snowpacks/ radioisotopes

IDENTIFIERS--/ scintillation counters/ *snow gages

R203239 68A MAJOR STORMS IN WESTERN COLORADO AND EASTERN UTAH
The 42 most intense general storms in eastern Utah and western Colorado since 1899 are studied in relation to the observed or estimated broad-scale upper air circulation patterns and sources of moisture. The report summarizes individual analyses of the storms. Storms are typed by reference to the behavior of the 500-mb patterns. The role of upper Lows in transporting moisture is emphasized. Indices are developed which evaluate storm moisture, temperature and influence of topography. The relative importance to the precipitation sequence of peak moisture versus proximity of upper Lows or troughs is compared. Moisture source regions are related to storm type and season. Local topographic effects are summarized by upper wind direction. Other relationships between various factors are discussed.

R203239 68A

Weaver, R L

METEOROLOGY OF MAJOR STORMS IN WESTERN COLORADO AND EASTERN UTAH

ESSA Tech Memo WBTM HYDRO 7, Weather Bur, Jan 1968. 75 p, 39 fig, 13 tab, 12 ref

ESSA Weather Bureau, Washington, D C

DESCRIPTORS--/ climatology/ hydrology/ meteorology/ moisture/ *storms/ mountains/ *rainfall intensity/ topography/ *rainfall/ advection/ air circulation/ air masses/ marine air masses/ orography/ storm structure/ precipitation (atmospheric)/ *rainfall disposition/ *weather patterns/ winds
IDENTIFIERS--/ western Colorado/ eastern Utah

R203248 68A COMPOSITION OF PRECIPITATION, S E ONTARIO, CANADA
Analyses of bulk precipitation of rainfall and snowfall from 12 sampling sites in S E Ontario are presented and compared with similarly derived results in other areas. The precipitation contains large amounts of dissolved cations and generally higher concentrations of some anions than previously reported. Contents of Si0 sub 2, Al, and Fe are especially high, although in snow, silica is absent and aluminum is quite high. Areal differences is silica content appear to be associated with local differences in lithology of the weathered rocks and soils. Iron is probably derived from atmospheric dust. Lithological differences are also reflected in the significantly higher nitrate-nitrogen concentrations in the limestone area. The content of sulfate is snowfall is high: this is considered to be a function of climatic and industrial causes. Has 16 references.

R203248 68A

Rutherford, G K

A PRELIMINARY STUDY OF THE COMPOSITION OF PRECIPITATION IN S E ONTARIO

Can J Earth Sci, Vol 4, No 6, pp 1151-1160, Dec 1967. 10 p, 1 fig, 4 tab, 16 ref

Queen's University, Kingston, Ontario, Canada

DESCRIPTORS--/ *rainfall/ leaching/ limestones/ rocks/ cation exchange/ geochemistry/ *chemical properties/ bibliographies/ *snowfall/ soil formation/ chemistry of precipitation/ *petrography/ *precipitation (atmospheric)

IDENTIFIERS--/ atmospheric dust/ Ontario, Canada/ dissolved cations/ rock weathering

R203249 67A BIBLIOGRAPHY: ESSA HYDROMETEOROLOGICAL PUBLICATIONS
Lists 105 ESSA publications pertinent to the joint fields of hydrology and meteorology. This bibliography is especially intended to serve the engineer by bringing to his attention the publications of hydrometeorological material that he often requires. General subjects include: Climatological Observations and Data, Liquid Water Content of Clouds in Storms, Maximum Persisting Dewpoints, Drought, Evaporation, Floods, Hydrologic Cycle, Hydrologic Networks, Precipitable Water, Computed Precipitation, Depth-area-duration Analysis, Excessive and Maximum Observed Precipitation, Mean and Normal Precipitation, Precipitation Measurements, Probable Maximum Precipitation, Radar, Solar and Sky Radiation, Rainfall Frequency, Relative Humidity, River and Flood Forecasting, River Stages, Runoff, Snow, Station History, Storms, Storm Surges, Streamflow Frequency Analyses, Temperature, Water Management, Water Supply Forecasts, and Wind.

R203249 67A

Paulhus, J L H

ANNOTATED BIBLIOGRAPHY OF ESSA PUBLICATIONS OF HYDROMETEOROLOGICAL INTEREST

Weather Bur, Office Hydrol Tech Memo WBTM HYDRO-6, Nov 1967. 27 p

ESSA Weather Bur, Washington, D C

DESCRIPTORS--/ *bibliographies/ *hydrology/ *meteorology/ climatology/ clouds/ dew point/ droughts/ evaporation/ radar/ runoff/ snow/ storms/ streamflow/ temperature/ floods/ hydrologic cycle/ radiation/ winds/ river forecasting/ water management (applied)/ humidity/ precipitation (atmospheric)
IDENTIFIERS-- / *hydrometeorology/ water supply forecasting

R203252X68A RAINFALL REDUCTION BY SMOKE FROM SUGARCANE FIRES
Rainfall and the number of shower rain days at 7 inland stations near the northeastern coast of Australia are compared with similar data for a nearby coastal station. Shower rains and shower rainfall have decreased at the inland stations but not at seaward stations out of the direct path of smoke from the cane fires. Rainfall reduction at the inland stations averages about 2 in., or 25% for the 3-month harvest period. The inland stations are downwind from an area where intensive burning of sugarcane produces smoke which may affect local precipitation. The data selected include only shower rainfall (0.05 to 1 in.) falling in onshore winds. Data for March and for the sugarcane harvest season of September-November are tabulated and compared on graphs. The data show changes during the last 60 yr in the inland rainfall pattern during the sugarcane harvesting season that differ from patterns seaward of the coast. Changes seem to be greatest since 1930, coinciding with major increases in cane production. Because changes in the March rainfall pattern are also sizable but erratic, any conclusions must be tentative. It is suggested that similar examinations of rainfall patterns and trends should be made in other areas where sugarcane is grown.

R203252X68A

Warner, J

A REDUCTION IN RAINFALL ASSOCIATED WITH SMOKE FROM SUGAR-CANE FIRES--AN INADVERTANT WEATHER MODIFICATION

J Appl Meteorol, Vol 7, No 2, pp 247-251, Apr 1968. 5 p, 5 fig, 2 tab, 9 ref

Commonwealth Scientific and Industrial Research Organization, Sydney, Australia
DESCRIPTORS--/ *weather modification/ *cloud seeding/ microclimatology/ climatology/ weather/ meteorology/ *smoke/ storms/ rainfall/ Australia/ *precipitation (atmospheric)/ distribution patterns/ sugarcane/ air circulation/ foreign reserch

IDENTIFIERS--/ *rainfall reduction/ condensation nuclei

R203277 68A CESIUM-144 AND STRONTIUM-90 RAINOUT RELATIONS
Analyses were made of time and space distribution of the concentrations of cesium-144 and strontium-90 in 1963 convective storms in Illinois. A network of 16 automatic rainwater samplers were operated in conjunction with recording rain gages and weather radar sets. Wide time and space variabilities were found in the distribution pattern of radioactive rainout. The ratio of cesium-144 to strontium-90 was appreciably lower at the end of rain storms than at or near the beginning. Although cause for this trend was not determined, possible influences are: (1) entrainment of surface-polluted air that is high in cesium-144 into the forward edge of stream systems, and (2) differences in the affinity of cesium-144 and strontium-90 particulates for various sizes of cloud droplets and raindrops. Use of the observed ratio between cesium-144 and strontium-90 as a reliable indicator of debris age, and of atmospheric source of radioactive rainout in rainwater, is questionable until verified by further research.

R203277 68A

Huff, F A and Stout, G E

RELATION BETWEEN CESIUM-144 AND STRONTIUM-90 RAINOUT IN CONVECTIVE RAINSTORMS

Tellus, Vol 20, No 1, pp 82-87, 1968. 6 p, 4 fig, 4 tab, 4 ref

Illinois State Water Survey, Urbana

DESCRIPTORS--/ raindrops/ storms/ instrumentation/ meteorology/ rainfall/ sampling/ convection/ atmospheric physics/ *cesium/ *fallout/ *strontium radioisotopes/ Illinois/ radiochemical analysis/ chemistry of precipitation/ radioactivity techniques

IDENTIFIERS--/ cesium isotopes/ *rainout/ *nuclear debris

R203215 68A MARGINAL ECONOMIC ANALYSIS IN RECREATION PLANNING

Recreation visitation and facility cost data were analyzed for 3 reservoirs in the Ohio River Valley to derive a method for selecting the optimum level of recreation facility development by marginal economic analysis. The visitation data were used to determine factors expressing the time distribution of facility use over the day, week, and year and the number of recreation visitors who could be accommodated per unit area. The facility cost data were used to estimate annual cost and marginal cost as functions of annual visitation. The marginal cost curve was found to have a characteristic U shape and depend on the size of the facility and the density of the surrounding population. Potential visitation to a large facility was estimated and converted to a potential benefit by a unit value based on travel cost. A method was developed for estimating actual visitation to a smaller facility as limited by size restrictions. The costs of providing a larger facility could then be compared with additional benefit from the greater number of visitors attracted to select the optimum facility size. Contains 31 references.

R203215 68A

Sirles, John Ellis III

APPLICATION OF MARGINAL ECONOMIC ANALYSIS TO RESERVOIR RECREATION PLANNING

Res Rep No 12, Univ Ky, 1968. 99 p, 14 fig, 19 tab, 31 ref

University of Kentucky, Lexington

DESCRIPTORS--/ *recreation/ planning/ project planning/ water resources development/ *cost comparisons/ *recreaction demand/ marginal benefits/ economic efficiency/ *marginal costs/ recreation facilities/ bibliographies

IDENTIFIERS--/ psychological aspects/ cost curves

R203221X67A LOCAL WATER SUPPLY BENEFIT-COST ANALYSIS

Communities facing an industrial-municipal water shortage have two broad courses: either private or public financing of water-replacement projects. Whether a community could supply water at a lower cost can be decided by a benefit-cost analysis (differing from analyses for Federal projects). The annual benefit from a community project is the present value of the annual cost savings that would result from the non-undertaking of the privately-financed alternatives. The average annual cost to the community is the annual net cash outlay for the purchase of water from the community project at a price just sufficient to cover the project costs. The cost of private alternatives is discounted by the corporate costs of capital; the cost of the community project, by the community's costs of capital. A direct consequence of the corporate income-tax structure is that the benefit-cost ratio will always be greater than unity if the returns to scale are constant and if both the community and corporate costs are discounted at the same interest rate. A numerical example based on the corporate tax structure in Louisiana demonstrates that a community-financed project, with its lower costs of capital, almost always will be more favorable than a private one.

R203221X67A

Stober, W J and Falk, L H

A BENEFIT-COST ANALYSIS OF LOCAL WATER SUPPLY

Land Econ, Vol 53, No 2, pp 328-335, Aug 1967. 8 p, 1 fig, 1 tab, 6 ref

University of Louisiana, Baton Rouge

DESCRIPTORS--/ *capital costs/ *cost comparisons/ depreciation/ benefit-cost ratios/ unit costs/ cost-benefit analysis/ diseconomies of scale/ *cost-benefit theory/ discount rate/ return to scale/ annual costs/ tax rate

IDENTIFIERS--/ *benefit-cost analysis

PROJECT PLANNING

R203222 68A COMPUTER ECONOMIC ANALYSIS OF FLOOD DETENTION STORAGE
A digital computer procedure for preliminary analysis of the economic justification of reservoir storage for flood control was developed and applied in an illustrative sample study. Given a specified reservoir site and a downstream flood plain divided into planning units, the University of Kentucky Planning Program III selects the economically efficient reservoir storage and associated combination of channel improvement, flood proofing, land-use management, and residual flooding for each downstream planning unit, stage by stage throughout the life of the project. A complete design and cost estimate of an earth dam with appurtanent structures is completed by the program. The program does not attempt final measure design but isolates those combinations of measures for which detailed analysis is warranted. Provided are a description of basic Program logic, a complete listing in Fortran IV, and a sample application to evaluate alternative flood control measures along the South Fork of the Licking River, Kentucky. Contains 23 references.

R203222 68A

Villines, James Ray

ECONOMIC ANALYSIS OF FLOOD DETENTION STORAGE BY DIGITAL COMPUTER

Res Rep 9, Univ Ky, 1968. 238 p, 12 fig, 22 tab, 23 ref, 2 append

University of Kentucky, Lexington

DESCRIPTORS--/ *earth dams/ flood plains/ digital computers/ spillways/ land management/ project planning/ right-of-way/ *flood control/ channel improvement/ non-structural alternatives/ *floodproofing/ scheduling/ hydrographs/ stream improvement/ economic justification/ flood plain zoning/ land use/ bibliographies
IDENTIFIERS--/ Licking River, Ky

ROCK MECHANICS

R203045 68A NEW CONSIDERATIONS ON THE VAIONT SLIDE
Published opinions on the Vaiont rock slide are reviewed with particular attention given to the chair-like shape of the slip surface. Investigations indicated no clay existed on the slip surface and the lower western part was horizontal. New calculations, including equilibrium factors not used previously, show friction values to maintain equilibrium are small. The calculations also indicated a questionable validity for static recalculations of the slide, especially since such calculations do not explain different phenomena occurring during reservoir level variations. By considering the slide as a creep phenomena, stabilization could develop in certain cases with constant or slowly reduced load, and in other cases, the sliding mass would accelerate with weakening, loss of bond, or material fatigue. Progressive failure assumed to occur at Mount Toc can also be related to creep phenomena. Recent investigations indicated the final high slide velocity was due to water thrust in the joints, resulting in a spontaneous loss of friction. The mass thixotropy effect may have played a minor role in the Mount Toc slide, but appears to occur frequently in jointed media. Has 87 references.

R203045 68A

Muller, L and Fairhurst C

NEW CONSIDERATIONS ON THE VAIONT SLIDE

Rock Mech Eng Geol, Vol VI, 1-2, 1968. 90 p, 25 fig, 1 tab, 87 ref

DESCRIPTORS--/ *rock mechanics/ *landslides/ sliding/ thixotropy/ stability analysis/ disasters/ slopes/ engineering geology/ creep/ rheology/ rocks/ mathematical analysis/ friction/ bibliographies/ geology/ clays/ water table/ shear strength/ ground water/ reservoirs/ concrete dams
IDENTIFIERS--/ slip surface/ *slope stability/ *rock slope stability/ *rockslides/ *Vaiont Valley, Italy

R203080 67A ROCK ELASTICITY IN PRESSURE TUNNEL DESIGN

Elastic properties of stratified anisotropic rock were determined using a method combining theoretical and field investigations. The procedure was applied in designing the Ingursk pressure tunnel in the Caucasus Mountains, USSR. Formulas were derived for determining elasticity and displacement of rock using the solution of the orthotropic plate problem where a circular opening becomes elliptical under uniform internal load. Hydrostatic pressure chamber tests were conducted in a gallery excavated in a solid, layered limestone similar to rock in the tunnel route. Field tests showed that elasticty modulus parallel to rock stratification is 1.8 to 3.5 times higher than in the perpendicular direction. Elasticity modulus in intermediate directions was calculated. Use of this method improves pressure tunnel design because actual properties of the surrounding medium are considered.

R203080 67A

Khachikian, G G

DETERMINATION OF THE ELASTIC CHARACTERISTICS OF STRATIFIED ANISOTROPIC ROCK FOR PRESSURE TUNNEL DESIGNS

Gidrotekh Stroit, No 9, pp 26-28, 1965. Transl from Russ, Bur Reclam Transl 724, Nov 1967. 9 p, 2 fig, 2 tab, 5 ref

DESCRIPTORS--/ elasticity/ *elasticity modulus/ rock excavation/ rock mechanics/ rocks/ limestones/ stratification/ anisotropy/ tunnels/ beds (geology)/ *tunnel design/ tunnel linings/ *pressure tunnels/ stress distribution/ stress/ strain/ deformation/ *displacements/ mathematical analysis/ foreign design practices/ field tests/ penstocks
IDENTIFIERS--/ rock properties/ ring displacements/ USSR/ pressure chamber test/ Ingursk Powerplant, USSR/ internal loads

R203151X68A SWELLING CHARACTERISTICS OF ROCK

Unsupported excavations in clays, shales, marls, and mudstones may encounter difficulties from swelling upon exposure to moisture. The properties of rock affecting swelling are discussed and a simiple test is described for measuring the swelling of a rock specimen immersed in water. The relationships between void index (percent absorption or saturated moisture content), unit weight, and seismic wave velocity are examined. Swelling pressures are estimated from modulus of elasticity and swelling strain. There are various methods for scaling-up swelling measurements to determine the potential swelling of a rock mass. Seismic wave velocity is dependent upon void content, and can be used to estimate the void index for an in situ rock mass. Rock mass porosity and density may be estimated from the void index and unit weight. Potential volume swelling of a rock mass may be estimated by considering the volume of voids including fissures in the rock mass and the swelling potential of the rock. Examples are given of estimating potential volume swelling of rock and swelling pressures.

R203151X68A

Duncan, Neil; Dunne, Margaret H; Petty, Stuart

SWELLING CHARACTERISTICS OF ROCK

Water Power, Vol 20, No 5, pp 185-192, May 1968. 8 p, 17 fig, 1 tab

Portsmouth College of Technology; Kingston College of Technology, Great Britain

DESCRIPTORS--/ *swelling/ sedimentary rocks/ void ratios/ clays/ marl/ wave velocity/ seismic waves/ porosity/ expansion/ *expansive forces/ *rock mechanics/ stress/ strain/ voids/ *rock excavation/ tunnels/ test procedures/ fractures/ stress relieving/ tunnel linings/ moisture/ excavation/ shales/ clay shales/ engineering geology
IDENTIFIERS--/ rock properties/ rock slope stability/ swelling pressures/ underground openings

R203011 66A TUCSON WASTEWATER RECLAMATION PROJECT
This first annual report of the Tucson Wastewater Reclamation Project contains area maps, tables, graphs, design drawings, forms, and other pertinent data, along with a summary of the work produced during the first yr of the grant period. The report is made in compliance with Water Pollution Control Demonstration Project Grant No WPD-108-01-65, dated June 10, 1965, awarded to the City of Tucson, Arizona, Department of Water and Sewers. The phases of the TWRP may be divided into (1) the construction, operation and monitoring of a tertiary treatment facility in the form of a pilot filter and (2) the accumulation and evaluation of analytical, physical and documentary evidence from the study of wells within the outlined project area. The primary purpose of the project is to demonstrate the chemical, microbiological and virological safety and aesthetic acceptability of including renovated wastewater as a dependable and substantial portion of the future water supply for Metropolitan Tucson.

R203011 66A

Davis, Gordon E and Stafford, John F

FIRST ANNUAL REPORT, TUCSON WASTEWATER RECLAMATION PROJECT, JUNE 1965-JUNE 1966

Tucson Wastewater Reclam Proj Rep, July 1966. 66 p, 17 fig, 7 plate, 2 tab

Water & Sewers Department, Tucson; University of Arizona, Tucson

DESCRIPTORS--/ *water reuse/ projects/ sewage treatment/ wells/ water quality/ water filters/ effluents/ water pollution/ waste disposal/ *waste water/ *waste water treatment/ municipal wastes/ water pollution treatment/ treatment facilities/ water wells/ hydrogeology/ irrigation water/ microbiology/ waste treatment
IDENTIFIERS--/ *Tucson, Ariz/ effluent-charge system/ *waste water reclamation

R203020 67A ACTIVATED SLUDGE BACTERIA CHARACTERISTICS
The replica-plating technique and Lochhead's nutritional method were combined in exploratory experiments to test their feasibility as useful means for characterizing the aerobic heterotrophic flora of activated sludge and to minimize the burdensome process of isolation, purification, and testing of isolates. In the test run, the method was about 86% reliable at the 0.05 level of significance. About 40% of the total number of bacteria able to grow on an aqueous extract of activated sludge did not grow on media containing glucose, amino acids, growth factors, and inorganic salts. The requirement for activated sludge extract suggested the existence of a requirement for unidentified nutrients contained in the activated sludge extract. This investigation was supported by Research Grant WP-00645-01 from the Federal Water Pollution Control Administration. Has 20 references.

R203020 67A

Prakasam, T B S and Dondero, Norman C

AEROBIC HETEROTROPHIC BACTERIAL POPULATIONS OF SEWAGE AND ACTIVATED SLUDGE, II: METHOD OF CHARACTERIZATION OF ACTIVATED SLUDGE BACTERIA

Appl Microbiol, Vol 15, No 5, pp 1122-1127, Sept 1967. 6 p, 5 tab, 20 ref, disc

Rutgers, The State University, New Brunswick, N J

DESCRIPTORS--/ laboratory tests/ bibliographies/ *bacteria/ microbiology/ biology/ *sewage/ sewage treatment/ *aerobic bacteria/ testing/ nutrient requirements/ *activated sludge/ analytical techniques/ nutrients/ coliforms

IDENTIFIERS--/ activated sludge bacteria/ *replica plating technique/ *Lochhead's nutritional method

R203029 67A BEHAVIOR OF ACTIVATED SLUDGE
The objectives of this research, supported by Public Health Service Research Grant No WP-00787, were: (1) To develop a mathematical model based on a combination of microbiological growth kinetics and process materials balances that quantitatively describe the steady and transient state behavior of the activated sludge process, (2) to test the mathematical model by conducting activated sludge experiments at steady and unsteady state on a laboratory scale using a synthetic substrate, (3) to conduct limited studies of a pilot scale activated sludge system treating domestic sewage in order to determine the applicability of the model to a practical situation, and (4) to formulate predictions, from previous studies, concerning the effects of short-term transients on effluent quality from the activated sludge process. Has 65 references.

R203029 67A

Eckhoff, David W and Jenkins, David

ACTIVATED SLUDGE SYSTEMS: KINETICS OF THE STEADY AND TRANSIENT STATES

Sanit Eng Res Lab, Serl Rep 67-12, Univ of Calif, Dec 1967. 120 p, 44 fig, 21 tab, 65 ref, 4 append

University of California, Berkeley

DESCRIPTORS--/ unsteady flow/ flow/ kinetics/ bibliographies/ laboratory tests/ *sludge/ sanitary engineering/ microorganisms/ bacteria/ sewage/ *sewage treatment/ mathematical models/ *activated sludge/ *biological treatment/ behavior/ microbiology/ sewage bacteria

IDENTIFIERS--/ microbiological growth

R203111 67A DISSOLVED OXYGEN RESPONSE OF A STREAM
This work attempts to predict dissolved oxygen deficits in a stream with known initial conditions by considering the variations in deoxygenation and reaeration coefficients. A hypothetical stream situation is used to establish the significance in predicting dissolved oxygen deficit. Statistical models are formulated and tested for the variations in these coefficients using published data. Simulation techniques using the Monte Carlo method are employed in predicting the probabilitstic variation in dissolved oxygen deficits for known initial conditions and the results are verified with the survey data observed for the Ohio River-Cincinnati Pool reach. The predicted results using a probabilistic model are found to agree with the observed values within practical limits and give more consistent results than conventional methods. Contains 82 references.

R203111 67A

Kothandaraman, Veerasamy

PROBABILISTIC ANALYSIS OF WASTEWATER TREATMENT AND DISPOSAL SYSTEMS

Water Resour Center Res Rep 14, Univ Illinois, June 1968. 153 p, 21 fig, 16 tab, 2 chart, 82 ref

University of Illinois, Urbana

DESCRIPTORS--/ Ohio River/ *dissolved oxygen/ bibliographies/ pollution abatement/ waste disposal/ waste water/ sewage effluents/ water quality/ sewage disposal/ water pollution/ stream pollution/ mathematical models/ *reaeration/ model studies/ *statistical methods/ Monte Carlo method

IDENTIFIERS--/ deoxygenation coefficients

R203112 68A TRACER STUDIES ON RAPID SAND FILTRATION
Instrumentation design and methods devised for using radiotracers, cesium-137 and iodine-131, in a study of variables involved in rapid sand filtration are outlined. Procedures developed for separating particles of sharply defined size ranges are discussed. The pattern of deposition of particles within the filter medium has been observed for a number of different particle sizes. Evidence has been observed that both adsorption and desorption processes occur, and that these processes are associated with the kinetics of particle motion. Results of experiments conducted to define the counting geometry and sensitivity of the radiation detection system are reported. A method for encapsulating the tracer isotope inside the tagged particles and automation of the detector scan of the filter bed with associated data recording are discussed. The many experimental results recorded, with few exceptions, have been found consistent and reproducible.

R203112 68A

Eichholz, G G and Craft, T F

RADIOTRACER STUDIES ON RAPID SAND FILTRATION

Georgia Inst of Technol Completion Rep, Apr 1968. 8 p, 3 fig, 1 drwg

Georgia Institute of Technology, Atlanta

DESCRIPTORS--/ adsorption/ *filtration/ flocculation/ vermiculite/ *sand filters/ water filters/ waste disposal/ waste water/ water treatment/ *radioisotopes/ tracers/ cesium isotopes/ iodine isotopes

IDENTIFIERS--/ *radioactive tracers

R203149 68A WATER BETTERMENT BY GROUND-WATER RECHARGE
Seepage of poor quality water may be a source of ground-water pollution. However, such water may be improved considerably as it moves through the soil. This paper describes installations to control entry of low quality water into the soil and its percolation to and below the ground water. This phenomena is then called seepage not recharge. An important advantage of waste water renovation by recharge is its aesthetic aspect. It is clear that when sewage effluent percolates through the soil to the water table, for practical purposes, it loses its identity and on reaching a well would be pumped as ground water. Such a procedure would probably have greater public acceptance then purifying sewage effluent by other methods where the product, however pure, would carry the connotation of "purified sewage." Assuming amortization and operation costs of recharge basins $1000/acre/yr and a recharge rate of 200 ft/yr the cost of renovating water would be $5/acre-ft. With unfavorable soil or aquifer conditions which permitted only 50 ft/yr the cost could rise to $20/acre-ft. It is noted induced seepage, or ground-water recharge, is being used increasingly to renovate sewage effluent and/or other polluted water.

R203149 68A

Bouwer, Herman

WATER QUALITY IMPROVEMENT BY GROUND-WATER RECHARGE

Agr Res Serv Pap 41, 1968. 22 p, 9 ref

Agricultural Research Service, Phoenix, Ariz

DESCRIPTORS--/ *ground water/ *water quality/ *water pollution/ waste water/ *spreading basins/ recharge wells/ percolation/ microorganisms/ *water treatment/ *water filters/ underground water storage/ sewage effluents/ sewage treatment/ *groundwater recharge/ water filters/ sanitary engineering /waste water treatment/ pit recharge
IDENTIFIERS--

R203220X67A E. COLI SEROTYPES SIGNIFICANCE IN WASTEWATER EFFLUENT

This study on the renovation of wastewater effluent was intended to evaluate the significance of the survival of coliform bacteria and Escherichia coli serotypes in the effluent, to determine the influence of the effluent on the occurrence of coliform bacteria in birds located in the spray area, and to evaluate the effectiveness of this procedure for renovating the effluent by the use of the coliform density for determining the purity of the wastewater. The results showed that in the chlorinated effluent, members of the Klebsiella-Aerobacter group outnumbered E. coli by a ratio of 9:1. It also was found that the sewage effluent irrigation had no influence on the occurrence of coliform bacteria in the wild birds and that percolation of the effluent through the soil to a depth of 2 to 4 ft (51 to 102 cm) is sufficient for reclamation of the effluent to a state where it is practically free of coliform bacteria.

R203220X67A

Glantz, Paul J and Jacks, Thomas M

SIGNIFICANCE OF ESCHERICHIA COLI SEROTYPES IN WASTEWATER EFFLUENT

J Water Pollut Contr Fed, pp 1918-1921, Nov 1967. 4 p, 3 tab, 10 ref

Pennsylvania State University, University Park

DESCRIPTORS--/ sewage effluents/ *water reuse/ water pollution/ E. coli/ chlorination/ *waste water (pollution)/ waste water treatment/ animal wastes (wildlife)/ soil water movement/ *coliforms/ birds

IDENTIFIERS--/ *E. coli serotypes

R203225 68A REMOVAL OF PHOSPHATE FROM DIGESTER LIQUOR

Lime treatment of sludge digester supernatant liquor for removal of phosphate was studied. Batches of raw supernatant liquor and supernatant liquor subjected to bioaeration were treated with high calcium hydrated lime to determine if sludge settleability could be improved by particle nucleation techniques. Variables investigated were phosphate residual, pH level of treatment, lime dosage, settling time, aeration period, return sludge dosage and sludge production. The results indicate pH level to be the principal variable affecting phosphate residual, although some effects were attributed to coprecipitation and sludge dispersion. Generally, treatment to pH of 11 to 12 was required to obtain phosphate residuals in the 20 to 30 ppm range. A settling period of 12 hr following lime treatment produced stable phosphate residuals and effected a practical degree of sludge compaction. Two days of bioaeration reduced lime dosage by 20 to 45% and reduced sludge production by about 45%. The addition of return sludge to supernatant liquor prior to lime treatment increased sludge subsidence rates and reduced waste sludge volume. Practical return sludge dosages ranging from 1.2 to 3.2 times the weight of precipitate formed in the reaction reduced volume of waste sludge by 20 to 42%.

R203225 68A

Parsons, William A and Glennon, J M, Jr

LIME TREATMENT FOR REMOVAL OF PHOSPHATE FROM DIGESTER SUPERNATANT LIQUOR

Water Resour Res Center Bull 7, Va Polytech Inst, 1968, 56 p, 20 fig, 12 ref

Virginia Polytechnic Institute, Blacksburg

DESCRIPTORS--/ sanitary engineering/ sewage/ sewage disposal/ waste disposal/ *sewage treatment/ settling basins/ sludge/ *sludge digestion/ lime/ phosphates/ pH/ digestion tanks/ sedimentation/ *phosphorus/ sewage lagoons/ *sludge disposal/ domestic wastes

IDENTIFIERS--

SANITARY ENGINEERING

R203230X68A USE OF SEWAGE EFFLUENT AT LIVERMORE, CALIFORNIA
Treated sewage effluent from the Livermore municipal system is used to replenish water hazards and to provide water for irrigation of the golf course and fire protection at the golf course and adjacent airport. The 5-mgd plant uses the activated-sludge system and biological filter to remove 86% of the BOD and 96% of the suspended solids. The effluent does not need to be held in oxidation ponds, but flows directly from the final clarifier through the chlorination contact tanks and into the irrigation system. The effluent first goes into 4 artificial lakes that form the water hazards on the golf course. At night, water from the lakes is pumped into the underground system to irrigate the tees, fairways, and greens. The bottoms of the lakes have been left unsealed so the effluent can percolate down to recharge the groundwater. Effluent also is used to irrigate areas near the runways that presently are leased for agriculture. Eventually the system will provide irrigation water for a new 150-acre junior college campus nearby. The high nitrate content of the effluent fosters turf and crop growth. The golf course and airport are expected to produce revenue above operating and debt-retirement costs.

R203230X68A

Parness, W H

GOLF COURSE AND AIRPORT IRRIGATE WITH SEWAGE EFFLUENT

Amer City, Vol 83, No 5, pp 90-92, May 1968. 3 p, 3 illus

City of Livermore, Calif

DESCRIPTORS--/ *sewage effluents/ sewage disposal/ waste disposal/ water treatment/ *water reuse/ sanitary engineering/ filtration/ groundwater/ percolation/ water spreading/ *artificial recharge/ water purification/ irrigation water/ *waste water disposal/ activated sludge/ *reclaimed water/ biological treatment/ induced infiltration/ artificial use
IDENTIFIERS--/ effluent reuse/ biological filters

SOILS ENGINEERING

R203143 68A ENGINEERING PROPERTIES OF LOESS
Published values of engineering properties of loess are scarce according to the author. His paper provides data to summarize and compare such properties for loess from 8 states including Alaska. Loess is an aeolian soil, usually buff colored, composed of loosely arranged angular particles of sand, silt and clay in which silt sized particles predominate. Most particles are coated with thin films of clay which are the major cementing agent of a loess body. A unique feature of loess is its ability to stand in vertical faces. Specific gravity, permeability, bearing capacity and other properties are discussed for different loesses. Well accepted conclusions include: (1) gradation, compaction and classification are very uniform between loess from different areas; (2) inplace densities range from 66 to 104 pcf; (3) consolidation is rapid under load if a loess is saturated, or nearly so; but large settlement is uncommon where such densities are over 90 pcf which figure is a criterion; and (4) shear strength depends greatly on moisture content. Has 23 references.

R203143 68A

Sheeler, J B

SUMMARIZATION AND COMPARISON OF ENGINEERING PROPERTIES OF LOESS IN THE UNITED STATES

Highway Res Rec, No 212, pp 1-9, 1968. 9 p, 7 fig, 1 tab, 23 ref

Iowa State University, Ames

DESCRIPTORS--/ *loess/ *aeolian soils/ soil consolidation tests/ soil physical properties/ soil classifications/ moisture content/ porosity/ *finegrained soils/ grain sizes/ soil shrinkage/ settlement/ soil structure/ soil moisture/ soil texture/ shear strength/ consolidation/ bibliographies/ soil density
IDENTIFIERS--/ soil plasticity

R203144X67A STRUCTURES ON SWELLING SOILS

Deformation and serious damage to buildings constructed at locations underlain by swelling Pleistocene clays are described. Procedures for treating the foundation material, such as placing a sand cushion or flooding the soil are presented. At 1 site 5 to 8 ft of recent loam lay above a 10- to 13-ft clay layer, the top 2 ft being weathered. Ground water was from 50 to 60 ft below the surface and was confined to a sand layer below the clay. The uplift of 6 markers in the brick walls of a waterworks building at the site was observed for 7 yr. Minimum uplift was 0.4 in. and the maximum 5.5 in. Over 90% of the uplift took place in the first 2 yr after the structure was completed. At this location borehole samples showed that water content of the clay, due to leakage from pipelines, increased over 10% to an average value of 38%. Tests indicated that a sand cushion and local flooding resulted in only insignificant uplift compared to that in foundations on untreated bases.

R203144X67A

Sorochan, E A; Burov, E S; Kulachenok, B G

CONSTRUCTION OF STRUCTURES ON SWELLING SOILS WITH PREPARATION OF THE BASE

Soil Mech Found Eng, No 4, pp 281-285, July-Aug 1967. 5 p, 5 fig, 2 ref

DESCRIPTORS-/ *expansive clays/ structures/ uplift pressures/ swelling/ *foundations/ *differential settlement/ cushioning/ deformation/ clays/ building/ structural behavior/ displacements/ moisture content/ foreign design practices

IDENTIFIERS-/ *prewetting/ USSR/ soil-structure interaction

R203145X67A DEFORMATION OF ROCK-FREE SOILS

Assuming a theoretical homogeneous isotropic medium to calculate deformations of soils and the theory of limit equilibrium to estimate bearing capacity describes only part of the total picture of soil behavior under load. These assumptions neglect the nonlinear character of the relation between soil stresses and total stabilized strain tensors and deviators, dilatancy, deformability and other factors of soil strength. Construction of a model to describe rock-free soil is presented. The model covers the prelimit and limit states and also the problem of expansion of a spherical cavity in an unbounded soil mass under internal pressure. The model permits tracing the stress-strain changes and development of regions of limit equilibrium with increase of cavity pressure. Stabilized dilational strains of main types of rock-free soils under static load are noted as being largely irreversible. For most soils the plastic part of dilational strain predominates. These strains, complex stress, the spherical strain tensor and other soil parameters are discussed and relationships presented by 3 graphs and some 23 equations.

R203145X67A

Ioselevich, V A

LAWS OF DEFORMATION OF ROCK-FREE SOILS

Soil Mech Found Eng, No 4, pp 232-237, July-Aug 1967. 6 p, 3 fig, 9 ref

DESCRIPTORS-- / *soils/ *foundations/ structural design/ elastic theory/ elastic deformation/ plastic deformation/ tensile stress/ limit design/ soil tests/ tensor analysis/ rheology/ soil mechanics/ finegrained soils/ stress analysis/ foreign research

IDENTIFIERS--/ dilation/ USSR/ deviator stress

R203219 68A POND SEALING BY CHEMICAL TREATMENT

Over 500 permeability tests with 8 soil-dispersing chemicals were conducted on 9 Tennessee soil types. Sodium pyrophosphate treatments at 2 and sodium carbonate (soda ash) at 5 tons per acre were the most successful. These treatments costing approximately $375 per acre for chemicals reduced the permeability of the 9 soils to from 1/10 to 1/100 of the permeability of identical but untreated samples. Laboratory test results suggest that at least 1 ft of well compacted relatively impervious seal blanket over porous areas of pond floors is necessary to prevent rupture of the seal blanket under 10-ft heads. Nine seriously leaking ponds were treated according to the best procedures developed in the laboratory. Eight of these treated ponds held well; and between January 1 and November 15, 1967, the mean ratio of minimum to maximum pond depths was 0.74. One pond developed serious leaks which were successfully repaired to a pond depth of 6 ft. The field tests substantiated the laboratory tests in that chemical treatments can, for certain situations, be effective in reducing reservoir seepage.

R203219 68A

Sewell, John I

LABORATORY AND FIELD TESTS OF POND SEALING BY CHEMICAL TREATMENT

Water Resour Res Termination Rep, Univ Tenn, May 1968. 79 p, 14 fig, 14 tab, 11 ref, 5 append

University of Tennessee, Knoxville

DESCRIPTORS--/ *permeability/ reservoirs/ lagoons/ *sealing compounds/ ponds/ dispersing agents/ seepage/ sodium compounds/ soil treatment/ *reservoir leakage/ Darcys law/ farm ponds/ water holes/ *soil sealants

IDENTIFIERS--/ *chemical sealants/ *seepage control

R203255 68A WATER-BEARING DEPOSITS IN SUBSIDING AREAS

Land subsidence in extensive areas of the San Joaquin and Santa Clara Valleys, California is causing serious problems in construction and maintenance of costly engineering works such as large canals, water-distribution systems, and drainage and flood-control works. Four core holes in the Los Banos-Kettleman City area, 2 in southern Tulare County and 2 in the Santa Clara Valley, were drilled to obtain samples for determination of physical and hydrologic properties of the subsiding materials. Cores from the holes were analyzed for particle-size distribution, permeability, specific gravity, dry unit weight, porosity, Atterberg limits, consolidation, acid solubility, and gypsum content. Laboratory data in tabular and graphic form are presented, laboratory analysis methods are described, and interrelationships of some of the physical and hydrologic properties are shown. Reference data required for future interpretive reports on subsidence research are furnished.

R203255 68A

Johnson, A I; Moston, R P; Morris, D A

PHYSICAL AND HYDROLOGIC PROPERTIES OF WATER-BEARING DEPOSITS IN SUBSIDING AREAS IN CENTRAL CALIFORNIA

Geol Surv Prof Pap 497-A, pp A1-A71, 1968. 71 p, 24 fig, 10 tab, 46 ref

Geological Survey, California

DESCRIPTORS--/ *aquifers/ sedimentation/ *sediments/ *land subsidence/ clays/ silts/ *soil physical properties/ artesian water/ permeability/ Atterberg limits/ porosity/ specific gravity/ shrinkage/ particle size/ artesian pressures/ moisture content/ solubility/ *subsidence/ canal construction/ void ratio/ California
IDENTIFIERS--/ Santa Clara Valley, Calif/ Tulare County, Calif

R203256 67A STATIC BEHAVIOR OF SOILS

The stability of earth structures subject to hydrostatic and seepage forces is primarily dependent upon the shear strength of the materials of the embankment and foundation. Whether these materials are natural deposits of soils or manmade fills, the shear strengths are invariably anisotropic. Experimental procedures were devised to preserve the anisotropic nature of the soil and to determine its highly directional strength parameters. Using an anisotropic varved silt, the shear strength and pore pressure characteristics were found to be profoundly affected by principal stress, failure plane, and strata orientation. As expected, the angle of internal friction, was greatest and least for samples sheared normal and parallel to the strata. Based on an empirical relationship between soil strength and principal stress, stratification and failure plane directions, a general method of stability analysis has been developed for inherently anisotropic soils.

R203256 67A

Nacci, V A

STATIC BEHAVIOR OF SOILS

Pap, Civ and Ocean Eng, Univ Rhode Island, 1967. 22 p, 20 fig, 3 tab, 14 ref

University of Rhode Island, Kingston

DESCRIPTORS--/ *anisotropy/ shear planes/ *shear stress/ shear tests/ shear strength/ pore pressures/ strain/ stability analysis/ earth dams/ soil physical properties/ static tests/ silts/ kaolin/ triaxial shear/ mohr failure theory/ overconsolidation/ moisture content/ direct shear/ residual stress/ soil mechanics/ slope stability/ slip-circle method
IDENTIFIERS--/ Bishops method

R203258 67A MEASURING SOIL MOISTURE WITH RADIO WAVES

Experimental data were obtained for the field strength of 3 AM radio stations and 1 FM station and for the corresponding moisture content of the soil at various depths and locations between the radio stations and the field strength meter. The relationship between field strength and soil moisture content was investigated. The 2 AM stations which were located farthest away, 71 and 130 mi, showed the most promising relationship between field strength and soil moisture content. The moisture content at 3 ft appeared to have a much greater influence on the field intensity of these stations than surface moisture. The AM station located 25 mi away and the FM station 22 mi away showed much less relationship between soil moisture and field strength.

R203258 67A

Eagleman, Joe R and Moore, Richard K

INTEGRATED SOIL MOISTURE MEASUREMENT USING RADIO WAVES

Kansas Water Resour Res Inst Proj Completion Rep, Univ Kansas, 1967. 62 p, 17 fig, 7 tab, 7 ref, 5 append

University of Kansas, Manhattan

DESCRIPTORS--/ *soil moisture/ moisture content/ *radio waves/ radio reception/ wave length/ test procedures/ soils/ wavelengths/ conductivity

IDENTIFIERS--

STRUCTURAL AND ARCHITECTURAL ENGINEERING

R203036X68A OPTIMUM DESIGN USING AVAILABLE SECTIONS
Conventional optimum structural design methods assume that a continuous spectrum of member sizes is available to the designer. For example, in the minimum-weight rigid-plastic design of stiff-jointed frameworks, the weight per unit length of frame members is assumed to be a linear function of their full plastic moment. Actually, the sections available consist of a finite range of discrete member sizes. By making use of discrete programming techniques, design methods may be derived that are not dependent on theoretical weight-strength functions, but work directly with the available discrete sections. Two classes of design problems are considered: (1) the design of stiff-jointed frameworks using rigid-plastic theory; and (2) the elastic design of statically determinate triangulated frameworks subject to deflection constraints. Has 20 references.

R203036X68A

Toakley, A Raymond

OPTIMUM DESIGN USING AVAILABLE SECTIONS

Proc Amer Soc Civil Eng, J Struct Div, Vol 94, No ST5, pp 1219-1241, May 1968. 23 p, 8 fig, 6 tab, 20 ref, 2 append

Commonwealth Department of Works, Melbourne, Australia

DESCRIPTORS--/ *optimum design/ *structural design/ structures/ frames/ structural analysis/ structural members/ structural engineering/ trusses/ bridge design/ bibliographies/ deflection/ *rigid frames/ weight/ foreign design practices/ plasticity

IDENTIFIERS-- / Monte Carlo method/ *space frames/ Gomory's algorithm/ *rigid structures/ Australia

WATER-PLANT-SOIL RELATIONS

R203073X68A PAN EVAPORATION AND EVAPOTRANSPIRATION
Pan evaporation data are useful for estimating losses from reservoirs and lakes, and for estimating evapotranspiration from agricultural crops using procedures relating evapotranspiration to pan evaporation. Researchers at Utah State University developed a formula for estimating pan evaporation from extraterrestrial radiation and climatic data. This dimensionally sound formula utilizes the climatic data most readily available, and should provide reliable estimates of pan evaporation for a wide range of climatic conditions and latitudes. Tables are presented to simplify application of the formula when electronic computers are not used. Three formulas are included for estimating evapotranspiration for several agricultural crops, using as the principal parameters either extraterrestrial radiation, pan evaporation, or measured incident radiation with the climatic data. These formulas were developed from limited data and may not be reliable for a wide range of climatic conditions and latitudes. Has 20 references.

R203073X68A

Christiansen, Jerald E

PAN EVAPORATION AND EVAPOTRANSPIRATION FROM CLIMATIC DATA

Proc Amer Soc Civil Eng, J Irrig Drainage Div, Vol 94, No IR2, pp 243-265, June 1968. 23 p, 13 tab, 20 ref, append

Utah State University, Logan

DESCRIPTORS--/ *evaporation/ *evapotranspiration/ estimating/ weather/ climatology/ meteorological data/ solar radiation/ cloud cover/ crops/ wind speed/ consumptive use (water)/ irrigation/ *water requirements/ humidity/ temperature/ bibliographies

IDENTIFIERS--/ *evaporation pans/ elevation/ evaporation coefficient

R203094X68A WATER RELEASE AS A SOIL PROPERTY

The volume fraction of soil water released to growing plants is proposed as a soil property for comparing soils for plant use or for evaluating structural changes in a given soil. A procedure is described for measuring water release as a function of soil suction. An application is illustrated for use with soil containers or field practices. The procedure proposes gravimetrically measuring transpiration water loss from a soil-plant system involving 1 gal of soil. Soil water depleted by root action is measured at arbitrary points during a transient drying cycle as simultaneous readings of soil suction are made, using tensiometers or resistance blocks calibrated to read soil suction above the 1-bar range limit of tensiometers. Examples of water-release curves are given for 3 soils having widely varying textures. Two soils with widely differing textures had nearly identical water-release curves. A sandy- or coarse-textured soil had a favorable water-release characteristic for shallow profiles but would lose 2/3 of the stored water to downward drainage if used in a field profile showing a soil suction of 10 cb in the surface soil following irrigation. One soil subsample was treated with VAMA, causing a marked increase in water release.

Richards, Sterling J

R203094X68A

WATER RELEASE AS A SOIL PROPERTY RELATING TO USE OF WATER BY PLANTS

Trans Amer Soc Agr Eng, Vol 2, No 1, pp 74-77, Jan-Feb 1968. 3 p, 4 fig, 1 tab, 5 ref

University of California, Riverside

DESCRIPTORS--/ soils/ soil science/ *agronomy/ evapotranspiration/ soil physics/ tensiometers/ soil profiles/ *plant (botany)/ soil texture/ agriculture/ grasses/ soil physical properties/ *soil moisture/ moisture content/ soil tests/ test procedures

IDENTIFIERS--/ moisture uptake/ *soil-water-plant relations/ *soil water storage/ soil suction/ *water retention/ *soil moisture movement

R203118X67A TRANSPIROMETER TO MEASURE TRANSPIRATION

This study compares transpiration results using the electronic hygrometer and quick weighing methods. It determined that quick weighing results from several species compare closely to hygrometer data in direction. The study describes the water loss from greasewood (Sarcobatus vermiculatus) branches differing in condition and from saltgrass (Distichlis stricta) where separate clumps were studied. The dark green leaves of greasewood appear to be better able to control water loss than the yellow-green leaves. The study follows the curves for water loss during flowering and fruiting of sagebrush (Artemisia tridentata) and rabbitbrush (Chrysothamnus nauseosus albicaulis) using the same 10 branches for study over a 2-month period. Both of these latter species appear to be able to control water loss during the period of fruit expansion somewhat independent of air temperatures and relative humidity. Water loss is rapid in rabbitbrush as the fruit accessory tissues dry out.

Stark, N

R203118X67A

THE TRANSPIROMETER FOR MEASURING THE TRANSPIRATION OF DESERT PLANTS

J Hydrol, Vol 5, pp 143-157, 1967. 15 p, 11 fig, 3 ref

University of Nevada, Reno

DESCRIPTORS--/ water requirements/ hygrometry/ plant (botany)/ water loss/ rabbitbrush/ *transpiration/ sagebrush/ flowering/ *desert plants

IDENTIFIERS--/ hygrometers

R203120 68A MOISTURE USE BY FRUIT TREES
Soil moisture and trunk growth of young apricot and peach trees were measured under floodwater spreading conditions in the Negev highlands of Israel. Twenty access tubes for a neutron moisture probe were placed in 4 concentric circles around each tree. The moisture measurements were taken to represent the soil moisture in a central cylinder and 3 concentric annuli having soil surface areas of 3.14, 9.42, 15.70, and 10.1 sq m, respectively. Rates of moisture depletion and trunk growth were different for each species and did not appear to be related to soil moisture availability. Young apricot trees produced nearly 3 times the trunk cross-sectional area as peach trees per unit of water depletion. Root distribution of the trees was estimated by interpreting the changes in soil moisture.

R203120 68A

Cohen, O P; Evenari, M; Shanan, L; et al

"RUNOFF FARMING" IN THE DESERT: II. MOISTURE USE BY YOUNG APRICOT AND PEACH TREES

Agron J, Vol 60, No 1, pp 33-38, 1968. 6 p, 5 fig, 1 tab, 12 ref

Volcani Institute Agricultural Research, Rehovot and Hebrew University, Jerusalem, Israel

DESCRIPTORS--/ runoff/ soil moisture/ soil moisture meters/ root development/ root distribution/ peaches/ growing period/ arid climates/ moisture meters/ irrigation/ *fruit crops/ *water spreading/ deserts/ *flood irrigation/ water harvesting

IDENTIFIERS--/ apricots/ Negev, Israel/ *runoff farming/ soil moisture movement

R203128X67A PERIODS OF PLANT GROWTH ESTIMATED FROM CLIMATIC DATA
To gain information on rainfall effectiveness, since it dominates the growth of forage throughout the year, water balance models employing total rainfall and potential evaporation over 5-day intervals were developed to estimate periods or plant growth in arid central Australia. Of 2 basic models developed, 1 expressed a relationship between an empirical measure of growth stage and the ratio of expected evapotranspiration in the absence of water stress to the potential evaporation. The other related the ratio of actual to expected evapotranspiration and the estimated soil water storage, under conditions of restricted soil water supply. A program prepared for the CDC 3600 computer was used to analyze the data. The seasonal rainfall pattern shows a summer maximum; however, the probability of soil water availability was highest in winter. The effectiveness of summer rains is greatly diminished by potential evaporation rates. The seasonal pattern of growth expectancy parallels that for soil water storage; however, at no station does the probability of a growth period commencing in any one month exceed 0.60 and this occurs only in Dec and Jan. The results may be of practical value in suggesting grazing practices in harmony with the basic climatic factors setting the pattern of growth. Has 17 references.

R203128X67A

Fitzpatrick, E O; Slatyer, R O; Krishnan, A I

INCIDENCE AND DURATION OF PERIODS OF PLANT GROWTH IN CENTRAL AUSTRALIA AS ESTIMATED FROM CLIMATIC DATA

Agr Meteorol, Vol 4, No 6, pp 389-404, 1967. 16 p, 9 fig, 2 tab, 17 ref

Commonwealth Scientific and Industrial Organization, Canberra, Australia

DESCRIPTORS--/ water balance/ grazing/ depth-area-duration analysis/ root zone/ range management/ time series analysis/ water storage/ *soil water/ *plant growth/ evapotranspiration/ droughts/ arid climates/ desert plants/ *moisture availability/ model studies/ recharge

IDENTIFIERS--/ Australia/ potential evaporation/ rainfall expectancy

R203130 68A WATER LOSS AND STOMATAL CONTROL IN SORGHUM
Temperature and diffusion resistance of leaves and micrometeorological factors were measured in a well-watered sorghum field in central Arizona during June. Shortwave radiation, soil heat flux, air temperature, air humidity, and wind speed were also measured. Analysis of a typical 24-hour period showed that the stomata regulate transpiration only during the periods of darkness and low light. This was determined from a comparison of the values for the canopy resistance as derived from direct measurement on leaves and as calculated from the environmental data. During the daylight period the sorghum plant acts like a wick. It was predicted that neither an increase in number or aperture of stomata nor a wetting of the entire foliage would increase the evaporative rate. The sorghum foliage was always found to be several degrees cooler than the ambient air, even in the middle of the day. Also the energy equivalent of the evaporative flux exceeded the net radiant flux at all times and by 80% over the 24 hour period.

van Bavel, C H M and Ehrler, W L R203130 68A

WATER LOSS FROM A SORGHUM FIELD AND STOMATAL CONTROL

Agron J, Vol 60, No 1, pp 84-86, Jan-Feb 1968. 3 p, 2 fig, 1 tab, 9 ref

U S Department of Agriculture and U S Water Conservation Laboratory, Phoenix, Ariz
DESCRIPTORS--/ evaporation/ *transpiration/ canopy/ micrometeorology/ *stomata/ *sorghum

IDENTIFIERS--/ plant physiology

R203135X67A SOIL MOISTURE IN GREASEWOOD AND SAGEBRUSH STANDS
Soil moisture measurements were made over a 2-year period in adjacent greasewood (Sarcobatus vermiculatus) and sagebrush (Artemisia tridentata) stands in the desert steppe region of southeastern Washington. Soil moisture was determined gravimetrically by twice-weekly weighings of buried, soil-filled cans arranged in open spaces between shrub clumps. Soil moisture accumulated during fall and winter. On March 19 the upper 4 dm of soil in the greasewood stand averaged 14.8% moisture as compared to 10% for sagebrush soil. The greater accumulation of moisture in the greasewood stand appeared to be the result of decreased evaporation losses and the lack of transpiration from shrub species which are leafless during winter and early spring. The average density of cheatgrass plants on the greasewood site was 47 plants/sq dm (n=24) as compared to 1.4 plants/sq dm (n=36) in the sagebrush site. The more luxuriant growth of cheatgrass in the greasewood stand was related to winter and spring retention of soil moisture.

Rickard, W H R203135X67A

SEASONAL SOIL MOISTURE PATTERNS IN ADJACENT GREASEWOOD AND SAGEBRUSH STANDS

Ecology, Vol 48, No 6, pp 1034-1038, 1967. 5 p, 4 fig, 2 tab, 3 ref

Battelle Memorial Institute, Pacific Northwest Laboratory, Richland, Wash
DESCRIPTORS--/ *soil moisture/ evaporation/ plant (botany)/ field tests/ vegetation/ vegetation effects/ *sagebrush/ transpiration/ bromegrass/ desert plants/ moisture availability/ brush/ seasonal/ Washington

IDENTIFIERS--/ *greasewood

R203009 67A ECOLOGY OF FARM PONDS IN SOUTHWESTERN USA
Water quality in farm ponds of the southwestern plains is often impai: by high turbidity due to suspension of colloidal clay. The reason for this turbidity in certain ponds but not in others was investigated as well as ecological consequences of turbidity. Pond morphometry and chemical characteristics of the water of 29 farm ponds were related to turbidity on a seasonal basis. Clarity of pond water was positively correlated with mean depth, pH, dissolved solids, and conductivity. Shallow ponds with large surface areas tended to be turbid. In selecting pond sites (or in improvement of existing ones), (1) the pond area should be small relative to pond volume; the mean depth great; (2) erosion and siltation should be prevented (possibly by settling basins); (3) roiling of the water by cattle discouraged; (4) gypsum or lime added to increase the pH, dissolved solids, and conductivity. Seasonal pigment diversity of 29 farm ponds was lower in turbid ponds than in clear ones suggesting an ecological consequence of turbidity, i.e.; phytoplankton populations in turbid ponds are always in the initial stages of algal succession. Clear ponds appear to be more suitable for fish production. Has 23 references.

R203009 67A

Toetz, Dale W

ECOLOGICAL FACTORS AFFECTING TURBIDITY AND PRODUCTIVITY IN PRAIRIE PONDS IN THE SOUTHERN GREAT PLAINS

Res Project Tech Completion Rep, Water Resources Res Inst, Oklahoma State Univ, Aug 1967. 34 p, 11 tab, 23 ref

Oklahoma State University, Stillwater

DESCRIPTORS--/ turbidity/ *ponds/ fish/ ecology/ *water quality/ suspended solids/ pH/ wind (meteorology)/ rainfall/ limnology/ surface water/ farm ponds/ conductivity/ colloids

IDENTIFIERS--/ productivity/ small impoundments/ Southwestern USA/ nitrification

R203010 67A SELECTED PAPERS ON WATER POLLUTION
This book of selected publications on biology of water pollution, water treatment and sewage and industrial waste treatment contains some of the many excellent and basic pertinent biological papers that have been commonly inaccessible to the contemporary investigator. These papers are often quoted and are a portion of the foundation upon which modern aquatic ecological scientific thought and decisions are often based in summating water pollution control investigations. This compiled collection will be of assistance in 3 phases of water pollution abatement: (1) it will provide a technical service to the aquatic ecologist through assemblage of informative literature; (2) it will illustrate many of the concepts upon which regulations have been formulated for the protection of aquatic life; and (3) it will aid in the training of new environmental scientists to meet today's and tomorrow's personnel needs in the conservation of our nation's natural resources. Has 530 references.

R203010 67A

Keup, Lowell E; Ingram, William M; Mackenthun, Kenneth M

BIOLOGY OF WATER POLLUTION: A COLLECTION OF SELECTED PAPERS ON STREAM POLLUTION, WASTE WATER, AND WATER TREATMENT

Fed Water Pollut Contr Admin Publ CWA-3, 1967. 290 p, 107 fig, 58 tab, 2 photo, 530 ref

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS-- / *water pollution/ waste disposal/ *sewage treatment/ fish conservation/ pollution abatement/ bibliographies/ ecology/ biology/ fish/ plankton/ water quality/ algae/ aquatic life/ stream pollution/ bacteria/ impurities/ *waste water treatment/ *waste water disposal/ waste treatment/ *industrial wastes/ *water pollution control
IDENTIFIERS--

R203012 67A STRUCTURE OF THE DIATOM COMMUNITY
In the present study 3 series of experiments were performed. One was to show the effect of the size of area and the number of species in the species pool which were capable of invading an isolated area on the number of species composing the diatom community. The second series of experiments was to show the effect of altering the invasion rate on the structure of the community. The third series of experiments was a comparison of the structure of diatom communities in structurally and chemically similar streams on the island of Dominica and in the United States. The temperature of the water in the 2 rivers was similar when the studies were made.

R203012 67A

Patrick, Ruth

THE EFFECT OF INVASION RATE, SPECIES POOL, AND SIZE OF AREA ON THE STRUCTURE OF THE DIATOM COMMUNITY

Proc Nat Acad Sci, Vol 58, No 4, pp 1335-1342, Oct 1967. 8 p, 1 tab, 7 fig

Academy of Natural Sciences, Philadelphia, Pa

DESCRIPTORS-- / environmental effects/ competition/ distribution/ aquatic life/ microorganisms/ distribution patterns/ *biological communities/ spatial distribution/ dominant organisms/ *diatoms/ invasion/ ecological distribution

IDENTIFIERS--

R203017 66A URBAN STORM WATER RUNOFF
This report is a compilation of selected abstracts pertinent to the problem of urban drainage. This bibliograph, is selective; for instance, papers describing a sewerage system and making only passing reference to some storm-water aspects were not included. Also no attempt was made to use references from textbooks which may have a few pages to a whole chapter devoted to stormwater runoff. The abstracting and indexing journals were used extensively in compiling the bibliography. However, other papers, published or unpublished, were abstracted and are included. Also included are a number of references compiled by Region II, Public Health Service, Division of Water Supply and Pollution Control, in February 1961, on the storm-water overflow problem. Many of the references are from foreign publications. References were divided into several broad categories and under each major topic the title of the paper is listed. It is felt that the title should give some indication of the subject matter and that this general subject index along with an author's index will make the bibliography more useful. Has 287 references.

R203017 66A

Anderson, Richard J; Evans, Francis L; Weibel, Samuel R

STORM WATER RUNOFF FROM URBAN AREAS: SELECTED ABSTRACTS OF RELATED TOPICS

Federal Water Pollut Contr Admin Rep, Washington, D C, April 1966. 98 p, 287 ref

Federal Water Pollution Control Administration, Cincinnati, Ohio

DESCRIPTORS-- / bibliographies/ runoff/ *storms/ *cities/ abstracts/ *rainfall/ *urban areas/ *surface runoff/ water treatment/ drainage/ instrumentation/ sewers/ water quality/ water pollution/ storm drains/ pollution abatement/ discharge measurement/ *storm runoff/ overflow

IDENTIFIERS--/ *urban drainage/ *urban hydrology

R203018 68A AQUATIC COMMUNITIES IN WATER RESEARCH
The maintenance of the aquatic environment of man in a healthy or natural condition is dependent upon the correct functioning of the aquatic ecosystem. This is necessary if we are to have multipurpose uses of our surface waters. With man's increased use of water, surface waters are becoming more and more polluted and will ultimately be destroyed. If man is to have multipurpose use of waterways, he must know how to manage them correctly. To do this he must understand how aquatic ecosystems function and how perturbation affects them. What is known about the structure and functioning of aquatic ecosystems is set forth along with how nutrients and energy are cycled through them. Our knowledge of effects of various types of pollution on these ecosystems is discussed. Those fields of research are indicated which need to be pursued to understand the structure and functioning of aquatic ecosystems. The kinds of basic studies needed to understand the effects of various types of pollution or perturbation are discussed along with how they can be diagnosed. Ways are suggested how research in this important field should be implemented.

R203018 68A

Patrick, Ruth

WATER RESEARCH PROGRAMS--AQUATIC COMMUNITIES

Office Water Resources Res Rep, Mar 1968. 22 p, 9 ref

Academy of Natural Sciences of Philadelphia, Pa

DESCRIPTORS--/ *ecology/ *aquatic life/ environment/ water pollution/ sea water/ fresh water/ brackish water/ stream pollution/ bacteria/ wastes/ fish/ invertebrates/ algae/ lakes/ streams/ pollution abatement/ energy transfer/ *ecosystems/ *biological communities/ food chains/ protozoa/ potable water/ *aquatic environment/ *water pollution effects/ nutrients
IDENTIFIERS-- / perturbation

R203019 67A WASTE TREATMENT IN PAPER MANUFACTURING
This industrial wastewater profile covers the paper industry and integrated pump and papermills in the United States as defined by Standard Industrial Classification 2621 (except building) of the Department of Commerce. The principal areas of discussion are: (1) the fundamental manufacturing processes and significant water and gaseous wastes generated by each operation; (2) process water use and reuse; (3) waste quantities and characteristics; (4) waste reduction practices (including both waste treatment and in-plant processing) and their effectiveness; and (5) waste treatment costs. Projections or estimates have been made for the changes, developments, and operating practices that will be prevalent in 1977 for each area of discussion. Has 130 references.

R203019 67A

Anon

COST OF CLEAN WATER: INDUSTRIAL WASTE PROFILE NO 3, PAPER MILLS, EXCEPT BUILDING

Federal Water Pollut Contr Admin Publication IWP-3, Nov 1967. 65 p, 9 tab, 130 ref, 4 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ *waste disposal/ industrial plants/ costs/ water reuse/ economics/ bibliographies/ water pollution/ *pollution abatement/ waste water/ wastes/ water treatment/ water quality/ *waste water treatment/ *pulp wastes/ *wood wastes/ *pulp and paper industry/ *waste treatment/ saw mills/ *treatment facilities/ byproducts/ industrial wastes
IDENTIFIERS--

R203022 67A INDUSTRIAL WATER POLLUTION CONTROL POLICY
This study is an examination of alternative possible approaches for providing incentives to industry to comply with pollution abatement standards being created under the Water Quality Act of 1965 and the Clean Water Act of 1966. The study is limited to the manufacturing industry, although there are significant water pollution problems associated with aspects of mining and agriculture as well. The primary focus of the technological analysis is on problems of organic and inorganic wastes, rather than thermal pollution. However, these other areas and problems are of vital interest to the nation's clean water program and some of the arguments developed in this report are applicable to other aspects of pollution as well. Among industrial incentives, it proved impossible to limit consideration to only a few obvious alternatives. In addition to more straight-forward devices like tax incentives, grants, and loans, less direct approaches were also examined, most notably the creation of treatment authorities for a whole area, river basin, or the part of such a basin within a single state. It became necessary to examine the problem of possible hardship cases, and adequacy of existing men and materials to operate expanded facilities. Has 84 references.

R203022 67A

Anon

INCENTIVES TO INDUSTRY FOR WATER POLLUTION CONTROL: POLICY CONSIDERATIONS

Federal Water Pollut Contr Admin Rep, Dec 1967. 119 p, 84 ref

ABT Associates, Inc, Cambridge, Mass

DESCRIPTORS-/ costs/ *industries/ water quality/ *water pollution control/ *pollution abatement/ economics/ benefits/ standards/ water quality act/ waste disposal/ wastes/ effluents/ water pollution/ cost-benefit ratio/ water treatment/ stream pollution/ *industrial wastes/ incentives/ water quality control/ financing/ grants/ *treatment facilities/
IDENTIFIERS--

R203028 67A SANTEE RECREATION PROJECT
This report presents the results of a study of Santee, California recreational lakes. The Santee lakes were planned to utilize the community's reclaimed sewage effluent. By the summer of 1965, a special basin adjacent to one of the lakes was supplied with reclaimed water and used for swimming. This was found possible after progressive use of the lakes for boating and then for fishing. The 7-agency cooperative study evaluated the fate of virus, total and fecal coliform, and fecal streptococci as waste water passed through conventional secondary treatment processes, sand filtration, and recreational lakes. Correlative physical, chemical, and biological data have also been obtained by study of the lakes and related land area. Observations related to eutrophication, vector control, epidemiology, and social acceptance and ecology of the entire recreational park were also obtained. Additional treatment provided by intermittent sand filtration met most of the requirements for recreational use of the terminal ponds. No health hazards have been demonstrated by the viral or other findings, and this fact had considerable impact in the promotion of public acceptance and use of the recreational facilities. Has 24 references.

R203028 67A

Merrell, John C Jr; Jopling, William F; Bott, Roderick F; et al

SANTEE RECREATION PROJECT, SANTEE, CALIFORNIA, FINAL REPORT

Fed Water Pollut Contr Admin Rep WP-20-7, Cincinnati, Ohio, 1967. 165 p, 35 fig, 1 plate, 33 tab, 24 ref, 21 append

California Department of Public Health; San Diego Department of Public Health, Calif
DESCRIPTORS-/ multiple purpose projects/ *water reuse/ *recreation/ ecology/ lakes/ water utilization/ viruses/ water treatment/ *sewage treatment/ effluents/ bacteria/ biology/ water quality/ waste water/ fish/ reclaimed water/ eutrophication/ California/ *waste water treatment/ coliforms
IDENTIFIERS-/ virology/ Santee Rec Proj, Calif/ Santee, Calif

R203030 67A OPINION SURVEY ON WATER POLLUTION CONTROL
This report is a survey of community leader attitudes on the water pollution problem in the Massachusetts municipalities of Springfield, Chicopee, and South Hadley. An unofficial, anonymous group of 12 individuals chosen in each community was made up of 2 representatives each from the institutional sectors of business and industry, labor, community relations, politics and government, education, and communications. These community leaders agreed on the importance of the pollution problem and the need for a cooperative regional approach. They also agreed that the regional problem had not been alleviated, and that Federal and state authorities had not been active enough in abatement work. They differed in respect to the priority they placed on the problem as compared to other environmental problems in the respective municipalities and in the metropolitan area. Further studies should be made using a wider spectrum of communities in several regions to evaluate the relationship between community leader attitudes and the community's socio-economic profile including the following factors: educational level, age composition, percentage of foreign born, occupational groupings, and mean annual income.

R203030 67A

Shanley, Robert A

A SURVEY OF COMMUNITY LEADER ATTITUDES ON WATER POLLUTION ABATEMENT IN SELECTED MASSACHUSETTS COMMUNITIES ON THE CONNECTICUT RIVER

Bur of Government Res Rep, Univ Massachusetts, Oct 1967. 32 p, 2 tab, 13 ref, 2 append

University of Massachusetts, Amherst

DESCRIPTORS--/ *water pollution/ *pollution abatement/ programs/ *public opinion/ public relations/ public works/ municipalities/ cities/ states (geographical)/ personnel/ leadership

IDENTIFIERS--/ *water pollution control/ Massachusetts/ *surveys (data collection)/ Federal agencies

R203041X68A EUTROPHICATION OF WATER
Symptoms of eutrophication, evaluation of its degree, and problems associated with inorganic enrichment are described. When considering remedial measures such as removing nitrogen and phosphorus from sewage effluents, the sources of nutrients to the system must be established and the likelihood that the proposed measures would prevent development of nuisance conditions or restore some amenity use of water that was lost must be evaluated. Increased use of detergents and increased amounts of fertilizers applied to land have contributed to increased nitrogen and phosphorus contents of river water. Indirect evidence suggests that 50% of the phosphorus in sewage effluents is derived from detergents. Amounts of nitrogenous fertilizers applied to agricultural land in Britain have doubled in 10 yr and land drainage has contributed much inorganic nitrogen to rivers. A nutrient balance sheet for a reach of the Great Ouse River is described. This balance sheet indicates that sewage effluents contribute a small proportion of nitrogen, silicon, chloride, and sulfate to this river, whereas the bulk of the phosphorus could be attributed to that discharged in effluents. Has 17 references.

R203041X68A

Owens, Morlais and Wood, Gavin

SOME ASPECTS OF THE EUTROPHICATION OF WATER

Water Res, Vol 2, No 2, pp 151-159, Feb 1968. 9 p, 3 fig, 2 tab, 17 ref

Water Pollution Research Laboratory, Stevenage, Great Britain

DESCRIPTORS--/ fertilizers/ *sewage effluents/ bibliographies/ *water pollution/ algae/ nitrogen/ oxygen content/ organic compounds/ *water treatment/ agriculture/ costs/ recreation/ economics/ water supplies/ reservoirs/ lakes/ phosphates/ phosphorus/ *water quality/ waste water

IDENTIFIERS--/ *eutrophication/ inorganic compounds/ nutrients/ foreign research/ domestic water/ detergents/ Great Britain

R203069X68A MANMADE CONTAMINATION HAZARDS
Ground-water hazards may result from adding wastes to water infiltrating the soil, or to soil through which water percolates. Contaminants include human, industrial, and commercial wastes; and those associated with use of water, fertilizers, and pesticides in agriculture. Experimental data indicate that particulate matter, including bacteria and viruses, does not move far with percolating water in the soil. Chemical products of biodegradation move freely and reach ground water. Since biodegradation products of organic wastes are the same as natural contribution of organic matter to the soil, the effect of domestic water use generally is to increase concentration of dissolved ions normally present in ground water. Hazards of ground-water contamination from industry consist of metal ions, phenols, tar residues, brines and exotic organics. Hazards from agriculture are pesticide residues and mineralization with nutrients and soluble soil fractions. Leaching from solid-waste land fills is possible with poor long-term management and might involve chemicals, iron, and various earth minerals. The most serious hazard results from buildup of dissolved solids to levels inimical to beneficial use.

R203069X68A

McGauhey, P H

MANMADE CONTAMINATION HAZARDS

Ground Water, Vol 6, No 3, pp 10-13, May-June 1968. 4 p, 4 ref

University of California, Berkeley

DESCRIPTORS--/ *water pollution/ *ground water/ waste water/ *wastes/ *waste disposal/ pesticides/ hazards/ organic compounds/ fertilizers/ leaching/ sewage/ sewage effluents/ viruses/ bacteria/ *contamination/ return flow/ garbage

IDENTIFIERS--/ *dissolved solids/ industrial wastes/ municipal wastes/ *biodegradation/ brines

R203075X68A NEED FOR NUTRIENT CONTROL
Nutrient control is needed to arrest eutrophication of lakes and streams. Cultural drainage is a major nutrient contributor and a logical point of attack on the problem. Soil erosion control and prevention of leaching from animal manures are helpful agricultural practices. Phosphorus removal is the most promising solution for eutrophication control, since some blue-green algae can fix nitrogen; other nutrients are present in natural waters or exist in quantities too minute for practical removal. Chemical analysis of lake water at frequent intervals can determine the nutrients that decline in concentration as primary productivity increases.

R203075X68A

Sawyer, Clair N

THE NEED FOR NUTRIENT CONTROL

J Water Pollut Contr Fed, Vol 40, No 3, pp 363-370, Mar 1968. 8 p, 5 fig, 1 tab, 11 ref

Metcalf and Eddy, Boston, Mass

DESCRIPTORS--/ *limnology/ lakes/ reservoirs/ streams/ contamination/ nitrogen/ phosphorus/ water analysis/ *water pollution/ water quality/ algae/ *pollution abatement/ control/ aquatic life/ dissolved oxygen/ surface runoff/ agriculture/ waste water

IDENTIFIERS--/ *eutrophication/ farms/ *nutrients

R203076X68A AERIAL INFRARED POLLUTION SURVEILLANCE
Airborne infrared imagery provides a mapping system for rapid surveillance and monitoring of thermal, organic, and inorganic pollution. Infrared systems, operating in the 8- to 14-micron portion of the electromagnetic spectrum, measure water-surface temperatures. Specific applications include: (1) determining in waterbodies thermal circulation and diffusion patterns produced by coolant discharge from powerplants; (2) assisting development of a thermal pollution index; (3) detecting thermal pollution and measuring river temperature downstream from discharges of heated water; and (4) establishing natural diurnal and seasonal ranges of water-surface temperatures. Water pollutants can be determined from temperature-independent emission and absorption properties. One approach involves spectrally characterizing materials by recording energy levels within narrow 1- to 2-micron bands across the 4- to 14-micron portion of the spectrum, and using the narrow-band multiple-spectrum curves for identifying pollutants.

R203076X68A

Van Lopik, J R; Rambie, G S; Pressman, A F

POLLUTION SURVEILLANCE BY NONCONTACT INFRARED TECHNIQUES

J Water Pollut Contr Fed, Vol 40, No 3, pp 425-438, Mar 1968. 14 p, 14 fig, 10 ref

Texas Instruments Inc, Dallas

DESCRIPTORS--/ *water pollution/ thermal properties/ *infrared rays/ spectrum analysis/ mapping/ *reconnaissance surveys/ *thermal radiation/ emissivity/ cooling water/ contamination/ physical properties/ sensors/ radiation measurement/ measuring instruments/ wave length/ aerial photography
IDENTIFIERS--/ *infrared imagery/ airborne surveying/ isotherms/ *aerial reconnaissance/ *thermal pollution/ surface temperature/ radiometry

R203083 68A MAXIMUM ACROLEIN CONTENT FOR RESERVOIRS
Experimental data were analyzed to determine the possible toxic effect of acrolein in reservoirs containing drinking water. A study was made of the stability of acrolein in water and influences on biochemical oxygen consumption. Experiments were conducted on effects of acrolein on development and extinction of saprophytic microflora. Albino rats were examined for physiological effects. The restrictive index of acrolein toxicity is its influence on the processes of natural self-purification. A concentration of 0.01 mg/kg of body weight is recommended as the threshold dosage. When water contains 0.01 mg/l of acrolein, the daily human intake of drinking water will constitute 0.0005 mg/kg of body weight. Prolonged access of this dosage into the organism evidentally is not dangerous from the standpoint of sanitation and toxicology.

R203083 68A

Goeva, O E

MAXIMUM PERMISSIBLE ACROLEIN CONTENT IN RESERVOIRS

Leningrad Sanitar-Gig Med Inst, Vol 81, pp 58-63, 1965. Transl from Russ, Joint Publ Res Serv Transl 733, June 1968. 6 p, 2 fig

DESCRIPTORS--/ reservoirs/ *water pollution/ municipal water/ cultures/ water supplies/ contamination/ *toxicity/ *herbicides/ microorganisms/ dosage/ biochemical oxygen demand/ aldehydes/ safety/ sanitation/ health

IDENTIFIERS--/ *acrolein/ potable water/ animal physiology

R203091X68A WASTEWATER REUSE
Water, man's most essential mineral, is used, reused, and used again. Water reuse estimates by U S cities show that 1/2 of the average surface supplies has passed through a municipal or industrial outfall. A single municipal water use contributes 50 mg/l of organic contaminants and 300-400 mg/l of dissolved organic materials after primary and secondary waste treatment. Conventional waste treatment is not designed to remove nutrients, inorganic salts, or nonbiodegradable organics; new advanced waste treatment processes are being designed to alleviate pollution by these contaminants and will renovate waste water into a usable product. Plans for deliberate water reuse are being developed in the U S, South Africa, England, Belgium, Japan, Mexico, the Bahamas, Chile, and Israel. A summary presents advanced waste treatment development in the U S according to treatment process, plant size, location, projected costs, and Federal Water Pollution Control Administration research and development grants.

R203091X68A

Stephan, David G and Weinberger, Leon W

WASTEWATER REUSE--HAS IT "ARRIVED"

J Water Pollut Contr Fed, Vol 40, No 4, pp 529-539, Apr 1968. 11 p, 1 fig, 5 tab, 3 ref

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ *waste water/ *water treatment/ water supplies/ *sewage treatment/ *water reuse/ water utilization/ water pollution/ pollution abatement/ sewage effluents/ sanitary engineering/ water quality/ water costs/ organic compounds/ municipal water/ foreign countries/ costs

IDENTIFIERS--/ dissolved solids/ *advanced waste treatment/ *waste water treatment/ *waste water use

R203092X68A CONTAMINANTS FROM STABILIZATION PONDS
Contaminants were measured in ground water near 10 ponds used for stabilizing raw waste water from small municipalities. The purpose was to establish concentration levels and travel distances of contaminants from ponds having relatively high infiltration rates, and to observe transformations of the contaminants in the ground water. Results can be used for determining safe distances between a stabilization pond and a shallow ground-water supply in sandy or silty soil. Constituents traced were ammonia, nitrogen, nitrites, nitrates, phosphates, and alkyl benzene sulfonate. Nitrogen was found mainly in the form of ammonia nitrogen and was reduced to background levels after 300 ft of underground flow. The data showed that: (1) Time is important in the travel of all contaminants. (2) Nitrate contamination of shallow ground water was apparently not a threat in the immediate vicinity of ponds studied; low nitrate concentration was apparently due to algal consumption of nitrates and ammonia nitrogen. (3) Phosphates were not found in significant concentrations, due to algal consumption and soil adsorption. (4) Alkyl benzene sulfonate was found in significant concentrations 200 ft from the ponds.

R203092X68A

Preul, Herbert C

CONTAMINANTS IN GROUNDWATERS NEAR WASTE STABILIZATION PONDS

J Water Pollut Contr Fed, Vol 40, No 4, pp 659-669, Apr 1968. 11 p, 7 fig, 2 tab, 13 ref

University of Cincinnati, Ohio

DESCRIPTORS--/ waste disposal/ waste water/ *water pollution/ *sewage effluents/ water quality/ water supplies/ water treatment/ percolation/ *ground water/ *contamination/ infiltration/ sewage disposal/ nitrogen/ sewage treatment/ nitrates/ phosphates/ sanitary engineering

IDENTIFIERS--/ nitrites/ ammonia/ ABS/ municipal wastes/ *oxidation lagoons/ sewage stabilization

R203109 68A SULFIDE TO SULFATE REACTION STUDIES
For the past several years, a fundamental study of the sulfide to sulfate reaction, relative to acid mine drainage chemistry, has been in progress at Ohio State University. This paper is a report on a limited area of this study, and is principally concerned with those investigations designed to point out the important physical and chemical parameters related to the kinetics of the sulfide to sulfate reaction. More speculation is presented than conclusions drawn. However, a number of general facts are listed and the effect of several important variables are described. Experimental observations for 2 types of pyrite oxidation, (1) aerobic and (2) ferric ion (anaerobic) are presented. These data are then interpreted and a mechanism suggested to explain the observed kinetics. This study was financed by Federal Water Pollution Control Administration Research Grant No. WP-00340.

R203109 68A

Smith, E E; Svanks, K; Shumate, K

SULFIDE TO SULFATE REACTION STUDIES

Pap, Ohio State Univ, 1968. 10 p, 5 fig, 4 tab, 12 ref

Ohio State University, Columbus

DESCRIPTORS--/ *sulfates/ kinetics/ *oxidation/ pyrites/ oxygen/ oxygen content/ decomposition/ ions/ pH/ *sulfides/ *chemical reactions/ mine drainage/ *acid mine water/ microbiology

IDENTIFIERS--/ hydrogen ion concentration/ *aerobic treatment/ aerobic bacteria

R203110 67A BIOLOGY OF FRESH-WATER ENVIRONMENTS
The authors of this book have used "Limnological Aspects of Recreational Lakes," Public Health Service Publication No 1167, (now out of print), by Mackenthun, Ingram, and Porges, as a base to expand the consideration and treatment of aquatic biota and aquatic environment. The present work is not a second edition. Rather, it discusses the identification, investigation, and control of problems associated with the biota in flowing streams, lakes reservoirs, and ponds. First introduced are the biological problems associated with fresh-water environments, reviews and gives examples of water uses, and cites briefly the history of Federal legislation governing water pollution and the Federal role in coping with it. The effects on the aquatic environment of temperature, dissolved oxygen, and light are considered, as are effects of streams on reservoirs and reservoirs on streams. The responses of algae, vascular plants, benthos, and fish to aquatic environment under various influencing forces are itemized. Some problems associated with defining the aquatic environment are discussed. The why, what, how, where, and when of lake and stream data collecting and reporting are delineated. Water associated pests are discussed. Has 569 references.

R203110 67A

Mackenthun, Kenneth M and Ingram, William M

BIOLOGICAL ASSOCIATED PROBLEMS IN FRESHWATER ENVIRONMENTS

Fed Water Pollut Contr Admin Rep, July 1967. 287 p, 23 fig, 60 plate, 11 tab, 569 ref

Federal Water Pollution Control Administration, Cincinatti, Ohio

DESCRIPTORS--/ *aquatic life/ herbicides/ algae/ environment/ biology/ bibliographies/ fresh water/ weeds/ weed control/ insects/ biological treatment/ lakes/ limnology/ *aquatic plants/ aquatic algae/ nutrients/ *aquatic animals/ aquatic weed control/ algal control/ eutrophication/ slimes/ *aquatic environment/ aquatic productivity/ aquatic insects
IDENTIFIERS--

R203229 68A PORTABLE WATER-SAMPLE FILTRATION UNIT

The design and use of a lightweight, portable, all-plastic pressure unit for rapid field filtration of water samples is described. Water samples need to be filtered to remove particulate (suspended) material prior to analysis. Generally it is desirable to filter the sample at the time of collection to prevent the solution of suspended material and to insure that any precipitated material, at the time of analysis, was originally in solution. The unit described uses standard 4-in. diameter filter disks and may be operated at pressures up to 65 psi. The unit consists of a 2.5-liter capacity lucite cylinder with an upper plastic fitting connected to a rubber hose and a lower fitting into which a micropore filter can be inserted. A hand-operated air pump is connected to the rubber hose to apply pressure. The unit will filter 10 times faster than the suction-type field filters commonly used.

R203229 68A

Skougstad, Marvin W and Scarbro, George F, Jr

WATER SAMPLE FILTRATION UNIT

Environ Sci Technol, Vol 2, pp 298-301, Apr 1968. 4 p, 3 fig

Geological Survey, Denver, Colo

DESCRIPTORS--/ *filtration/ membranes/ *water analysis/ plastics/ data collections/ *water quality/ sampling/ chemical analysis/ laboratory tests/ portable/ water sampling/ *filters/ equipment

IDENTIFIERS-/ *micropore filters

R203250X68A EFFECTS OF TEMPERATURE ON HARDNESS IN KARST STREAMS

A study of 2 streams in limestone areas in the Pennines of Yorkshire and Derbyshire in northern England shows how biological influences dominate the pattern of seasonal fluctuations of quality in a karst area. Crowdwell rising, a spring issuing from a reef limestone, and Gordale Beck, a stream draining limestone terrain, were both sampled at monthly intervals for about a yr. Correlation coefficients show the relation between calcium carbonate content of the water and antecedent air temperature. At Crowdwell rising the best correlation is with temperatures 105-125 days earlier; at Gordale Beck, with temperatures 84-104 days earlier. Rapid increases in calcium hardness, correlated with March temperatures, are attributed to a "spring burst" of microbial activity following thawing of the soil. The quality fluctuations seem related to seasonal changes in the carbon dioxide output in the soil and the time lag approximates the flow through time of water from its entry to its exit from the limestone mass. Thus, the changes might constitute a natural tracer to measure groundwater movement. Seasonal fluctuations in groundwater quality in other rock types also might reflect the activity of organisms respiring carbon dioxide into the soil. This might apply even where the fluctuations are within a narrow range.

R203250X68A

Pitty, A F

SOME FEATURES OF CALCIUM HARDNESS FLUCTUATIONS IN TWO KARST STREAMS AND THEIR POSSIBLE VALUE IN GEOHYDROLOGICAL STUDIES

J of Hydrology, Vol 6, No 2, pp 202-208, Apr 1968. 7 p, 3 fig, 1 tab, 11 ref

University of Hull, Great Britain

DESCRIPTORS--/ *limestones/ tracers/ *air temperature/ soil chemistry/ geochemistry/ carbon dioxide/ water quality/ seepage/ *Karst/ solutes/ groundwater/ groundwater movement/ foreign research/ *hardness (water)/ calcium carbonate/ correlation analysis/ *hydrogeology

IDENTIFIERS--/ karst water/ soil bacteria/ Great Britain

R203016 66A BIBLIOGRAPHY, MARINE ENVIRONMENT--OREGON
Indexed herein are bibliographic references to literature pertaining to the marine waters of Oregon. References to papers, depending on the subject matter contained in the paper, are indexed under one or more of the following headings: Marine Biology, Climate, Fisheries, Geology, Hydrology, Chemical and Physical Oceanography, and Bibliographies, Literature Surveys, and Compilations. Has 193 references.

R203016 66A

Ditsworth, George R

ENVIRONMENTAL FACTORS IN COASTAL AND ESTUARINE WATERS, BIBLIOGRAPHY SERIES--VOLUME I, COAST OF OREGON

Federal Water Pollut Contr Admin Publ WP-20-2, Washington, D C, Oct 1966. 61 p, 193 ref

Federal Water Pollution Control Administration, Corvallis, Oreg

DESCRIPTORS-/ *estuaries/ oceanography/ bibliographies/ biology/ marine geology/ hydrology/ reviews/ climatology/ *coasts/ *coastal engineering/ environment/ *sea water/ fisheries/ estuarine fisheries/ *aquatic environment/ Oregon

IDENTIFIERS-- / *coastal waters

R203021X67A BENEFIT-COSTS FOR LOCAL WATER SUPPLY
Communities facing an industrial-municipal water shortage have 2 broad courses: either private or public financing of water-replacement projects. Whether a community could supply water at a lower cost can be decided by a benefit-cost analysis (differing from analyses for Federal projects). The annual benefit from a community project is the present value of the annual cost savings that would result from the nonundertaking of the privately financed alternatives. The average annual cost to the community is the annual net cash outlay for the purchase of water from the community project at a price just sufficient to cover the project costs. The cost of private alternatives is discounted by the corporate costs of capital; the cost of the community project, by the community's costs of capital. A direct consequence of the corporate income tax structure is that the benefit-cost ratio will always be greater than unity if the returns to scale are constant and if both the community and corporate costs are discounted at the same interest rate. A numerical example based on the corporate tax structure in Louisiana demonstrates that a community-financed project, with its lower costs of capital, almost always will be more favorable than a private one.

R203021X67A

Stober, W J and Falk, L H

A BENEFIT-COST ANALYSIS OF LOCAL WATER SUPPLY

Land Econ, Vol 53, No 3, pp 328-335, Aug 1967. 8 p, 1 fig, 1 tab, 9 ref

University of Wisconsin, Madison

DESCRIPTORS-/ capital costs/ *cost comparisons/ depreciation/ unit costs/ *benefit-cost ratios/ water supplies/ economics/ analysis/ costs/ return to scale/ *cost-benefit theory/ diseconomies of scale/ *discount rate/ tax rate/ *cost-benefit analysis

IDENTIFIERS--

R203024 67A COMPARATIVE-PROJECTION MODEL OF RESERVOIR
Using 2 established reservoir projects, an economic simulation model for reservoir development was constructed. The 2 comparative areas used for the model development are reservoirs in central Texas and were constructed during approximately the same time period. The simulation model divides reservoir development into 3 stages--construction, fill-up, and postfill-up. For each of the stages economic variables were chosen which reflected economic activity attributable to the reservoir. Inputs of construction money, O&M, recreation, and investments were related to each respective stage and then used to determine the economic impact of the reservoir on the local area economy. A synthetic index based on economic inputs other than those used for the model was developed utilizing a control area. The index served as guideline to the mathematical development of the model and as a measure of the predictive accuracy of the model. A recreational survey was conducted to arrive at average recreational expenditures and develop the postfill-up stage of the model. Overall recreational attendance was projected, and experience ratios of the survey were applied. Has 20 references.

R203024 67A

Pearson, John E

A STUDY OF THE ECONOMIC IMPACT OF WATER IMPOUNDMENT THROUGH THE DEVELOPMENT OF A COMPARATIVE-PROJECTION MODEL

Water Resources Inst Tech Rep 8, Texas A&M Univ, College Station, Aug 1967. 199 p, 20 fig, 24 photo, 53 tab, 20 ref

DESCRIPTORS--/ *economics/ recreation/ *reservoirs/ simulation/ Texas/ forecasting/ benefits/ mathematical models/ *impoundments/ evaluation/ model studies/ *economic prediction/ *economic impact/ bibliographies

IDENTIFIERS--/ *comparative-projection models/ *comparative studies

R203026 67A STORING FRESH WATER IN SALINE AQUIFERS
Preliminary studies indicate that the underground storage of fresh water in saline aquifers may be feasible from a technical viewpoint. Such a process would involve injection of fresh water, storage until needed, and subsequent production from the same well. This work, based upon theoretical considerations and model studies, leads to a computer technique by means of which the recovery of stored fresh water may be estimated. Calculations involving 5 hypothetical aquifers indicate recoveries ranging from 25 to 85%, depending upon aquifer and fluid properties. Loss of fresh water as a result of both dispersion (mixing) and gravitational segregation was considered. Results obtained in porous flow models indicate that gravitational segregation is significantly retarded by the development of a mixed zone. Such a zone is developed naturally during injection and production as a result of fluid movement and to a lesser degree during the storage portion of the cycle as a result of diffusion. Economic considerations and well problems were not treated in the study.

R203026 67A

Esmail, O J and Kimbler, O K

INVESTIGATION OF THE TECHNICAL FEASIBILITY OF STORING FRESH WATER IN SALINE AQUIFERS

Water Resources Res, Vol 3, No 3, Third Quart, pp 683-695, 1967. 13 p, 5 fig, 4 tab, 14 ref

Louisiana State University, Baton Rouge

DESCRIPTORS--/ ground water/ saline water/ water supplies/ water storage/ *underground water storage/ reservoirs/ groundwater flow/ *underground storage/ mixing/ dispersion/ density/ porous materials

IDENTIFIERS-- / saline ground water

R203033 68A THIS ENVIRONMENT--FRIEND OR FOE
This paper presents the text of the George A. Miller lecture delivered at the University of Illinois in October 1967. The author reviews the scientific, biological, and sociological changes that have altered mankind's environment during the past quarter of a century. Differing opinions are quoted for causes and control of air, soil, and water pollution and the future effect such pollutants will have on the ecology. Among the conclusions drawn are: (1) Enough water, properly managed, is available for the needs of the USA for the foreseeable future. (2) Additional water can be made available by transmission from and through Canada; by desalination when economical; and by transmission within the USA. (3) Some receiving bodies of water are of better quality today than 25 yr ago; some are worse. (4) Scientific and technologic procedures are available for upgrading quality whenever public policy so dictates. (5) Many areas of ecological behavior, not well understood, should be researched. (6) The form and fiscal basis of institutional or managerial machinery require continuing analysis and adjustment.

R203033 68A

Wolman, Abel

THIS ENVIRONMENT--FRIEND OR FOE

Water Resources Center Special Rep No 1, Univ of Illinois, Jan 1968. 15 p, 3 ref

The Johns Hopkins University, Baltimore, Maryland

DESCRIPTORS-/ *environment/ benefits/ damages/ water pollution/ population growth/ water management/ policy matters/ forecasting/ aging/ *ecology/ water resources/ public health/ water quality/ eutrophication/ air pollution/ water transfer

IDENTIFIERS--/ pollution control

R203060X68A ECOLOGY AND WATER RESOURCES DEVELOPMENT
Interactions of phenomena, conditions, and processes create certain arrangements in nature commonly called ecosystems. The public generally recognizes that water resources developments affect certain objects and conditions in nature, but does not appreciate that changes in one facet of an ecosystem have ramifications and permutations that may extend throughout the ecosystem. Unconcern for ecological side effects in water resources developments has resulted in great damage to the environment, including economic and other losses. While water developments are indispensable to the use and management of water resources, natural resources are not discrete and isolated from one another, but occur in continuously interacting complexes. Water as a resource cannot be managed safely without giving adequate consideration to the consequences of developments solely for one purpose. This fundamental point is discussed by describing several water development cases and their ecological impacts. More attention must be given to ecological research if total public interest is to be served. Losses and values foregone must be weighed against values gained if wise choices are to be made in water resources development.

R203060X68A

Cain, Stanley A

ECOLOGICAL IMPACTS ON WATER RESOURCES DEVELOPMENT

Water Resour Bull, Vol 4, No 1, pp 57-74, Mar 1968. 18 p

U S Department of the Interior, Washington, D C

DESCRIPTORS--/ *ecology/ *water resources/ environment/ biology/ lakes/ limnology/ turbidity/ aquatic life/ industrial plants/ water pollution/ fish and wildlife/ *natural resources/ estuaries/ weather modification/ fish/ pollution abatement

IDENTIFIERS--/ *ecosystems/ eutrophication/ aquatic environment/ effect/ judicial decisions/ biological communities

R203063X68A PRESERVATION AND RIVER BASIN PLANNING
Comprehensive river basin planning requires reasoned choices between potential but possibly conflicting uses of a river. One legitimate use, preservation of open spaces and wild areas, sets the stage for conflicts between development-conservationists and preservation-conservationists. Planning cannot satisfy the needs of all interested groups in the water field. Preservation values are divided into 3 elements: recreation, fish, and a set of intangible factors incorporating wilderness, natural beauty, historic, and scientific values. A single basin cannot provide the best planner with enough wilderness for every outdoorsman and enough damsites for every developer. Planners must compromise many desires and present decisionmakers with an answer that does not unnecessarily offend interest groups. Operations of the 3 Federal agencies most involved in major river basin planning (the Army Corps of Engineers, Federal Power Commission, and Department of the Interior) are discussed. Preservation by legislative action was started in 1964; subsequent legislative proposals are discussed. The Upper Missouri joint study is presented as an example of river basin planning with alternatives. Has 52 references.

R203063X68A

Tippy, Roger

PRESERVATION VALUES IN RIVER BASIN PLANNING

Natur Resour J, Vol 8, No 2, pp 259-278, Apr 1968. 20 p, 2 tab, 52 ref

Izaak Walton League of America, Glenview, Ill

DESCRIPTORS--/ *river basin development/ *planning/ water utilization/ *preservation/ river basins/ water conservation/ bibliographies/ fish/ recreation/ water management/ water resources/ rivers/ water quality/ river regulation/ multiple purpose projects/ policy matters/ project feasibility/ natural resources/ wildlife
IDENTIFIERS--/ legislation/ Corps of Engineers/ Bureau of Reclamation/ Federal Power Commission/ water resources development

R203096X68A CONCEPT OF WATER REUSE
This article explores the water reuse concept with particular attention to the meaning of the term, the several categories of reuse, and current and future status of processes involved. Water reuse refers to acceptance and use of treated waste water as a source of supply for various purposes. Reuse may be accomplished by 1 or more of 4 basic cycles: (1) hydrologic cycle--sequence of rainfall, runoff, and evaporation from surface water; (2) natural cycle--self-purification of flowing water; (3) indirect cycle--recharging ground water with treated waste water; and (4) direct cycle--planned treatment of waste water for specific subsequent use. Examples of the 4 cycles are given. Conventional treatment, desalting, and total treatment methods are discussed. Direct-cycle water reuse is possible without a health hazard, although there is some question on the necessity or desirability of direct-cycle reuse. In the near future an increase of natural-cycle reuse is expected. Indirect-cycle reuse is under intensive study and, within the next 10 yr, will be used for replenishing ground water.

R203096X68A

Symons, George E

WATER REUSE--WHAT DO WE MEAN

Water Wastes Eng, Vol 5, No 6, pp 40-43, June 1968. 4 p, 4 fig, 1 tab

Water and Wastes Engineering, New York, N Y

DESCRIPTORS--/ water pollution/ *water reuse/ water supplies/ sanitary engineering/ *water treatment/ water utilization/ waste disposal/ *waste water/ sewage treatment/ groundwater recharge/ water quality/ municipal water/ irrigation/ industrial water/ demineralization

IDENTIFIERS--/ advanced waste treatment/ waste water treatment/ *waste water use

R203154 68A WATER-SUPPLY PROBLEMS--SOUTHWEST FLORIDA
A 300% population increase in 15 yr has created regional water problems, such as sea-water intrusion and shortages of supply, all related to attempts to modify and control the environment without adequate knowledge of the effects. Some conditions require immediate corrective action. Others, such as general lowering of water levels and gradual increase in chloride, ultimately will pose serious problems and limit further use of water. Sea-water intrusions are now avoided by building well fields in inland areas. A program to plug deep wells is relieving salt-water contamination of streams and shallow aquifers. Establishing a salinity line can forestall problems related to sea-water intrusion in canals and provide control of fresh-water discharge. Effective management and control of all water are required to forestall further deterioration and depletion of supply. Illustrations show rainfall-runoff comparisons, effects of pumping and rainfall on water levels, extent of salt-water intrusion in a shallow aquifer, and hydrologic conditions in uncontrolled and controlled canals carrying sea-water, Broad-area hydrologic studies under the total water concept are needed to provide data for problem solving and to guide in orderly development and management of the region's water resources.

R203154 68A

Boggess, Durward H

WATER-SUPPLY PROBLEMS IN SOUTHWEST FLORIDA

Geol Surv Open-File Rep, 1968. 27 p, 6 fig, 3 tab, 7 ref

Geological Survey, Washington, D C

DESCRIPTORS--/ *surface-groundwater relationships/ *water management (applied)/ hydrogeology/ canals/ Florida/ drainage/ artificial recharge/ aquifers/ water table/ artisian wells/ *water quality/ urbanization/ tidal waters/ saline water intrusion/ droughts/ rainfall/ runoff/ water level fluctuations/ water utilization/ *water supply/ irrigation
IDENTIFIERS--/ stream contamination/ *water appraisal needs/ land-use practices/ sea-water intrusion/ *quality deterioration

R203212 68A INCOME REDISTRIBUTION FROM RESERVOIR CONSTRUCTION
Because water resources investment has been evaluated from the economic efficiency objective, benefit-cost analysis has been criticized as ignoring other goals. Benefit and cost data collected for Dewey Reservoir in the Appalachian Mountains of eastern Kentucy were used to determine the incidence of benefits and cost among income intervals. Recreation as a project purpose proved more effective in redistributing income than flood control. Weighting the income maximization and income redistribution objectives according to the value judgment that income taxes collected represent equimarginal sacrifice showed income redistribution benefits to equal 18.2% of efficiency benefits. The percentage would be lower in higher income areas.

R203212 68A

James, L Douglas

A CASE STUDY IN INCOME REDISTRIBUTION FROM RESERVOIR CONSTRUCTION

Water Resour Res, Vol 4, No 3, pp 499-506, June 1968. 8 p, 3 tab, 13 ref

University of Kentucky, Lexington

DESCRIPTORS--/ flood control/ recreation/ optimum use/ *benefits/ cost-benefit ratio/ water utilization/ efficiencies/ *feasibility studies/ *reservoirs/ economics/ economic efficiency/ cost-benefit analysis/ *public benefits/ recreation facilities

IDENTIFIERS--/ *income redistribution

R203265 67A WATER RESOURCE DEVELOPMENT IN THE FARMINGTON VALLEY
The purpose of this study is to examine critically the pattern of governmental organization and the process of planning in one river basin--the Farmington Valley, which contains the largest of the tributaries to the lower Connecticut River. Specifically, the present study seeks to analyze the validity of the hypotheses suggested in prior studies as to the problems of governmental organization, the role of water resource interest groups (as represented by the Farmington River Watershed Association), and local attitudes toward the public interest. The analysis presents preliminary findings concerning the characteristics and roles of 2 principal parties in water resource management and planning in the Farmington Valley: key governmental agencies and the Farmington River Watershed Association. Further computer analysis will unearth more detailed relationships among the variables suggested. Subsequent findings will also concentrate on the comparable results for the 383 interviews taken among the general public. From this data analysis, it will be possible to relate the planning and managerial process in the Farmington Valley to the more general theoretical discussion of major political, organizational, and behavioral issues--to how men think about and how political systems utilize their natural resources.

R203265 67A

Kasperson, Roger E

POLITICAL ORGANIZATION AND THE PLANNING OF WATER RESOURCE DEVELOPMENT IN THE FARMINGTON VALLEY--A PRELIMINARY PROFILE

Inst Water Resour Rep 5, Univ Conn, Oct 1967. 20 p, 13 tab, 1 map, append

University of Connecticut, Storrs

DESCRIPTORS--/ *water resources/ water development/ *river basins/ *planning/ organizations/ drainage basins/ interstate compacts/ water policy/ public utilities/ questionnaires/ valleys/ watersheds/ river basin commissions/ administrative agencies/ political aspects/ *water resources development/ interstate/ federal government/ Connecticut
IDENTIFIERS--/ *Farmington River, Conn/ *regional planning

R203268 66A FINANCING STATE WATER PROJECTS
The interjurisdictional aspects of financing water resource development projects that result from the possibility of spillovers are explored and certain conclusions regarding the proper roles of the federal, state, and local governments are developed. A discussion of the relevant economic theory is presented, efficiency criteria are developed and are applied to water resource projects. An analysis of the relative merits of user charges and taxes offered and conclusions regarding the inadequacy of benefit-cost data for particular benefit types are shown to prevent the establishment of a theoretically justifiable revenue system. Some state policies are analized in the light of the analysis developed in the report.

R203268 66A

Daicoff, Darwin W

METHODS OF FINANCING STATE PARTICIPATION IN WATER RESOURCES DEVELOPMENT

Contrib No 4, Univ Kans, 1966. 34 p

University of Kansas, Lawrence and Kansas State University, Manhattan

DESCRIPTORS--/ *states (geographical)/ *water resources/ benefits/ flood control/ *projects/ water development/ economics/ benefit-cost ratios/ *finance/ taxes/ *methodology/ costs/ water laws/ Federal government/ local governments/ cost allocation/ legal aspects/ Kansas

IDENTIFIERS--/ revenues

R203271 67A OPTIMIZATION OF A WATER RESOURCES SYSTEMS
This report presents a portion of the results of a 2-yr project intended to develop analytical methods for optimization of water resources systems. Methods described were derived in rigorous context with the physical, legal, social, and economic realities of combined major water resource projects. Four major streams, 10 reservoirs, and associated pumping plants, aqueducts, and power generation facilities are included in the analysis. The objective maximized in this instance is financial feasibility for planning purposes based on deliveries of firm energy, firm water, off-peak energy, and off-season water. Output should be attainable by feasible operations during an historical sequence of dry years and was imposed as a planning criterion on the system. Analysis provides for specification of values, within complexly constrained limits, of firm energy, firm water, dump energy, and dump water to be produced in each of 120 periods in the critical periods at each of 10 reservoirs comprising 5 major subsystems. The procedure will be useful for determining the integrated system optimum outputs for firm water and energy. The analysis emphasized advantages of system operation, as compared to individual project operation under firm water and power contracts.

R203271 67A

Hall, W A and Shephard, R W

OPTIMUM OPERATIONS FOR PLANNING OF A COMPLEX WATER RESOURCES SYSTEM

Water Resour Center Contrib 122, Dec 1967. 75 p, 8 fig, 5 tab, 14 ref, 6 photo, 12 chart

University of Los Angeles, Calif

DESCRIPTORS--/ water resources/ *optimum use/ multiple purpose projects/ mathematical analysis/ water supply systems/ mathematical models/ linear programming/ hydroelectric power/ peak power/ power system operations/ decision making/ water delivery/ reservoir operaton/ *water utilization/ *water management applied/ *optimization/ marketing/ economics/
IDENTIFIERS--/ California State Water Proj

R203282 68A INPUT-OUTPUT MODEL FOR ECONOMIC EVALUATION OF WATER
This study reports the fifth phase of a continuing project concerned with the Economic Evaluation of Water conducted by the Sanitary Engineering Research Laboratory of the University of California under the sponsorshop of the University's statewide Water Resources Center. Today it is becoming widely recognized that water resource decisions must involve mass transfers of water for multiple benefits within regions encompassing areas which have potential for economic growth competing with others already highly developed economically. The objective of this study is to provide a technical basis for evaluation of effects of water resources policy in the Western States not only upon the economic sectors of the state itself but also upon its neighbors. This is the first stage of Phase 5 of the series and is designed to incorporate results of input-output research which has recently been undertaken in various Western States into construction of a multiregional input-output model. It follows the current interest of economic analysts in constructing models which tie together those of separate regions. Has 148 references.

R203282 68A

Davis, H Craig

ECONOMIC EVALUATION OF WATER--PART V--MULTIREGIONAL INPUT-OUTPUT TECHNIQUES AND WESTERN WATER RESOURCES DEVELOPMENT

Contrib 125, Univ California, Feb 1968. 142 p, 17 tab, 148 ref, 3 append

University of California, Berkeley

DESCRIPTORS--/ *water/ *water costs/ economics/ water resources/ states (geographical)/ bibliographies/ benefits/ *water development/ computer programming/ *policy matters/ mathematical models/ cost allocation/ input-output analysis

IDENTIFIERS--/ *input-output conversion

R203272 68A LAKE-ORIENTED RESIDENTIAL SUBDIVISIONS
The subject of this study is lake-oriented residential subdivisions located within the state of North Carolina. Specifically, focus is on the consumer of this type of development--the home buyer. This study looks at decisional variables of the home buyer to determine inputs for a consumer submodel linked to residential growth model. The home buyer's decisions are constrained largely by supply of dwelling sites provided. The consumer influences future development of residential sites by making choices among existing alternatives. One popular alternative in North Carolina recently is the lake-oriented residential subdivision. This study is primarily concerned with improvements in living environment of the housing consumer through the process of moving to new locations. Specific objectives of the study are to: (1) identify decisional variables for the buyer in a lake-oriented subdivision; (2) investigate methods for forecasting this type of demand, and (3) identify the consumer's attitudes regarding advantages and disadvantages of living in a lake-oriented subdivision. Interviews were conducted to more fully understand the preferences of consumers and their effect on decisions about moving. Has 32 references.

R203272 68A

Andrus, Newton W

LAKE-ORIENTED SUBDIVISIONS IN NORTH CAROLINA: DECISION FACTORS AND POLICY IMPLICATIONS FOR URBAN GROWTH PATTERNS--PART II - CONSUMER DECISIONS
Water Resour Res Inst Rep 10, Univ North Carolina, Apr 1968. 88 p, 4 fig, 26 tab, 32 ref, 3 append

University of North Carolina, Chapel Hill

DESCRIPTORS-- / real property/ *housing/ recreation/ urban areas/ land development/ *recreational facilities/ municipalities/ *lakes/ cities/ reservoirs/ marketing/ consumers/ *city planning/ water resources/ land use/ urbanization/ *community development/ *urban sociology/ water resources development/ lake shores/ North Carolina
IDENTIFIERS--

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